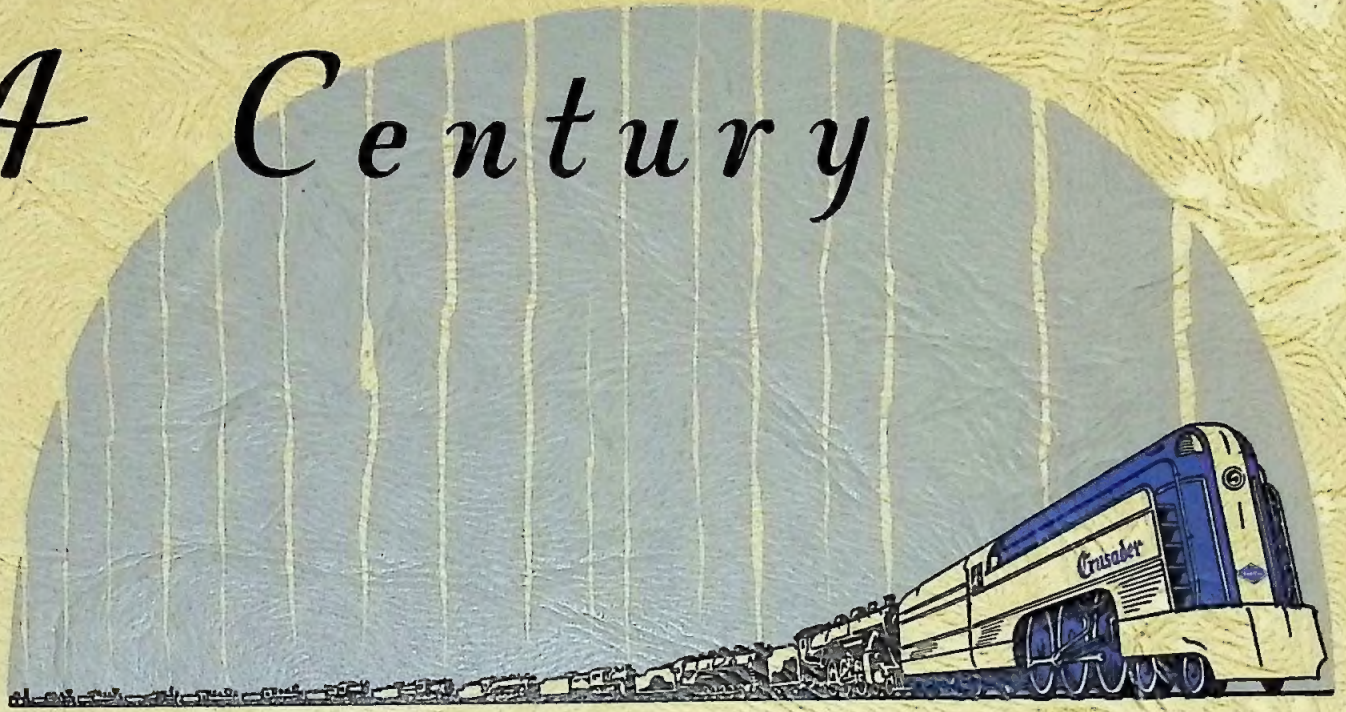
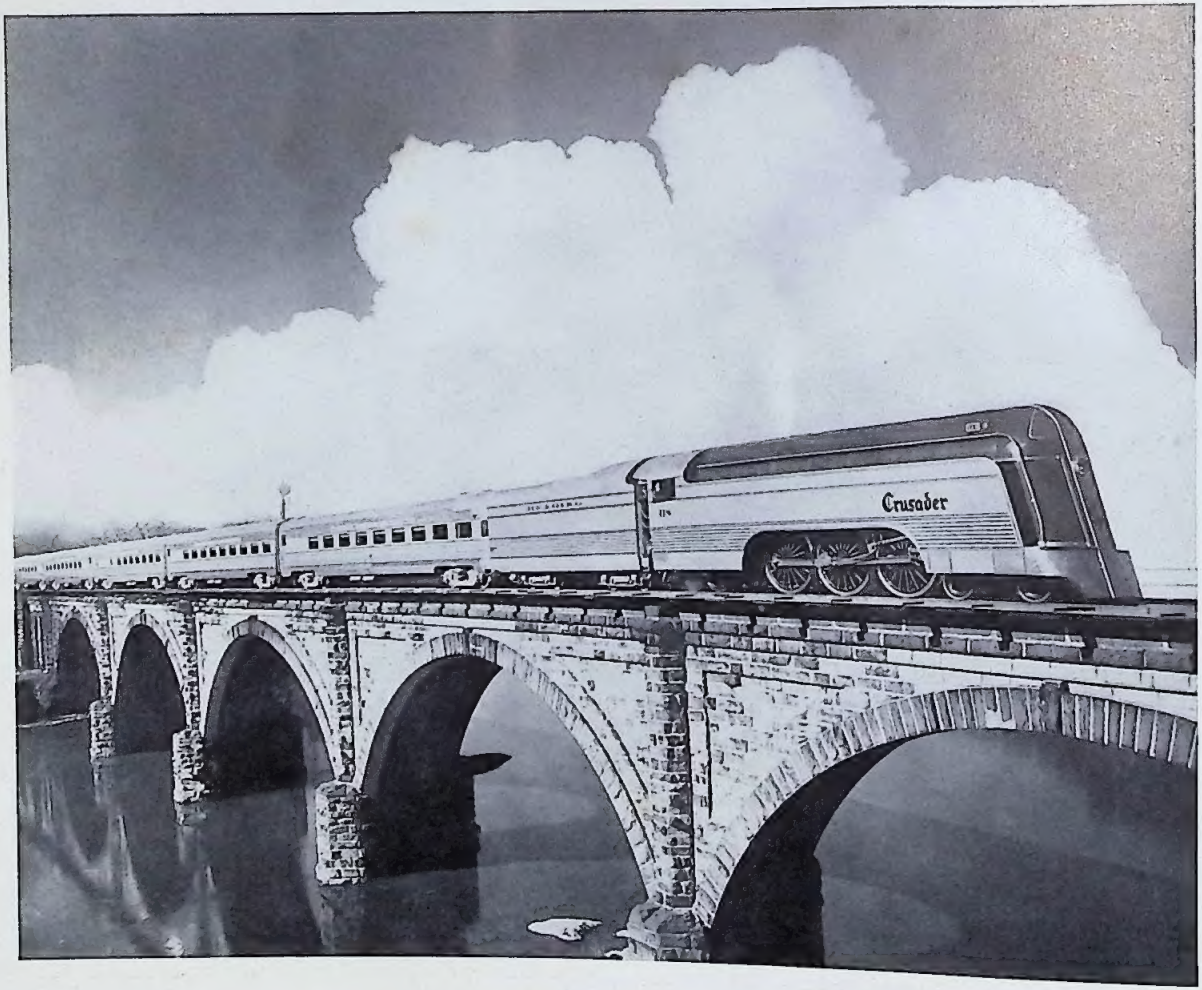
A Century



# of READING COMPANY

Reading Lines

MOTIVE POWER



"The Crusader"

Reading Company stainless steel streamlined train photographed on Falls Bridge, over the Schuylkill River, Philadelphia, Pa.

A Century of

READING COMPANY MOTIVE POWER

1832 1941

COPYRIGHT 1941, READING COMPANY

READING COMPANY · READING TERMINAL · PHILADELPHIA

FOREWORD

This book presents a pictorial and textual record of locomotives operated by the Reading for more than 100 years. With few exceptions, the evolution of the locomotive, as presented in these pages, is a history of motive power in the United States from the time of the importation of the first wood-burning engines from England to the most modern developments in rail transportation.

During this century of railroad growth, the Reading played a notable part not only in its contribution to the progress of the industrial East, particularly in respect to the development of the anthracite regions of Pennsylvania, but also in the mechanical improvements to motive power itself. This volume has been compiled to record these achievements for the student of the history of motive power of American railroads, and for the growing number of railroad enthusiasts and model builders.

From an early period in the Nation's history The Reading has consistently and continuously served the transportation needs of the territory through which it passed, taking over and supplementing the canals and tram roads of the Schuylkill region more than a century ago. Not only did it import one of the first engines but it also bought Baldwin's first locomotive, which was the second engine to run within the State of Pennsylvania. Through the following century, this company then participated in the developments of locomotives built by the Baldwin Locomotive Works. The *Gowan & Marx*, built by Eastwick and Harrison of Philadelphia, in 1839, exerted great influence on the young industry not only in this country, but it also became the pattern for the establishment of motive power on the first Russian trunk line railroad. The encouragement given Winans in Baltimore by the Reading, had a marked effect in stimulating the development of coal-burning engines.

More permanent, however, have been the technical contributions made by Reading engineers to motive power. No history of motive power can be written without the names of Kirk, Millholland and Wootten, all Reading officials, who left their everlasting stamp on the modern engine, not only in this country but abroad. The details of their work are included in this book. The shops at Reading, Pennsylvania, among the first in the nation, not only were the laboratories for the inventions of these men, but for nearly a century tens of thousands of mechanics have produced many of the finest engines to ride American rails. Here were built the world's speediest passenger engines and the sturdiest and most efficient freight locomotives.

During more than a century of service, the Reading has become the largest terminal railroad in America. It has been largely

responsible for the development of the port of Philadelphia, and aside from being the heaviest carrier of anthracite, its passenger service has served the most thickly populated portion of the country faithfully for ten decades.

Built primarily as an anthracite carrier, the Reading has kept pace with the times in the field of transportation. With the advent of new inventions has come the electrification of the suburban area of Philadelphia, the use of Diesel engines, and the establishment of bus and truck coordinated services. In 1937, the Reading introduced to the East the "Crusader," operating between Philadelphia and New York, the finest stainless steel train in the United States.

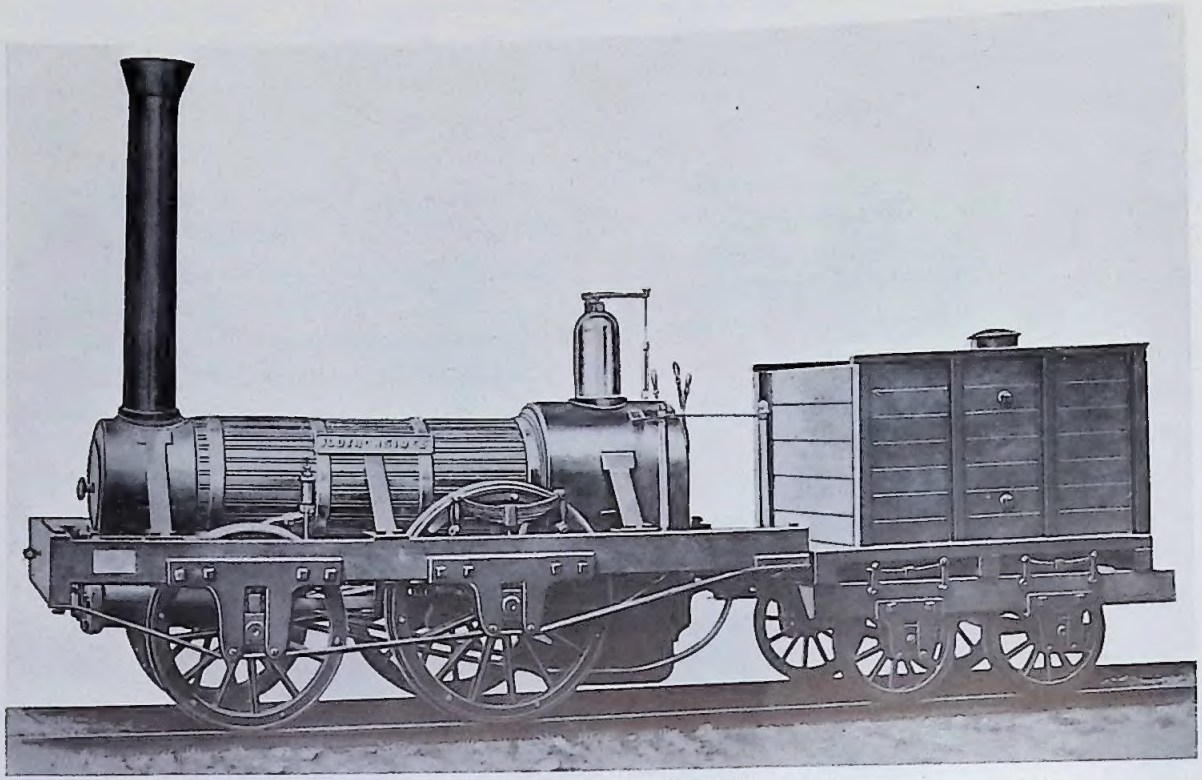
With these details the Reading Company presents this book, not only as a history of the past but also as an indication of the progress in service which the company will continue to maintain.

I wish to take this opportunity of expressing thanks to the many persons who cooperated in gathering technical information and photographs. I am deeply grateful to The Franklin Institute. The Historical Society of Pennsylvania, The Berks County Historical Society for assistance given, as well as to the following who materially assisted in historical and technical compilation:

J. B. Babcock, Professor of Railway Engineering, Massachusetts Institute of Technology; C. E. Fisher, President, The Railway and Locomotive Historical Society; Robert S. Henry, Association of American Railroads; Oliver Cromwell, former Assistant to Chief of Motive Power, Baltimore and Ohio Railroad Company; Paul T. Warner, Baldwin Locomotive Works, and Messrs. George M. Hart, C. L. Cheney, Karl Schlachter, Jr., C. L. Winey, Walter Lucas, Thomas Taber.

E. W. Scheer

President.



OLD IRONSIDES

This famous locomotive was the first built by Matthias W. Baldwin, founder of the Baldwin Locomotive Works. It was constructed for the Philadelphia, Germantown and Norristown Railroad in 1832, and since that road became a part of the Philadelphia and Reading Railroad in December, 1870, it was the first engine to run on any portion of the present Reading System. It

MATTHIAS W. BALDWIN

was the first locomotive to make scheduled runs within the State of Pennsylvania.

The model of *Old Ironsides* as shown on the opposite page represents the locomotive as it was originally built. The cylinders were 9½" x 18" and the two rear or driving wheels were 54" in diameter. The entire weight of the engine was about 12,000 pounds.

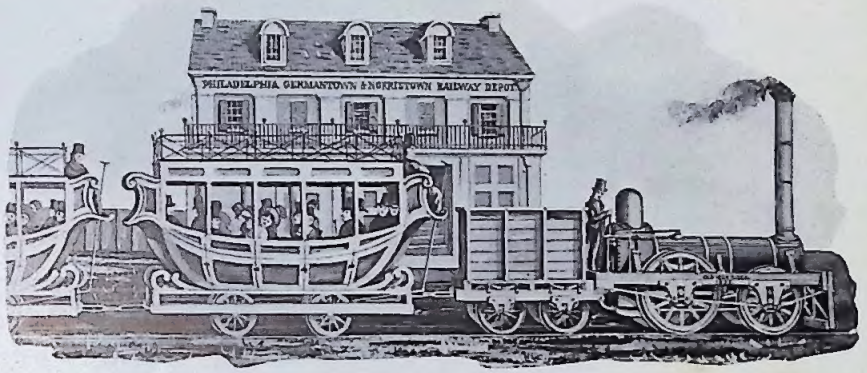
Matthias W. Baldwin entered a jewelers' and silversmiths' firm in Philadelphia in 1817, and later opened a similar business of his own. In 1825, in partnership with David Mason, a machinist, he turned to the manufacture of bookbinders' tools and cylinders for calico printing. When a stationary steam engine, which was bought for his business, proved unsatisfactory, Mr. Baldwin built another engine which was unusually compact in design and was especially adapted to meet the requirements of his shop. This engine and a small model of a steam locomotive, built later, established him as an ingenious mechanic.

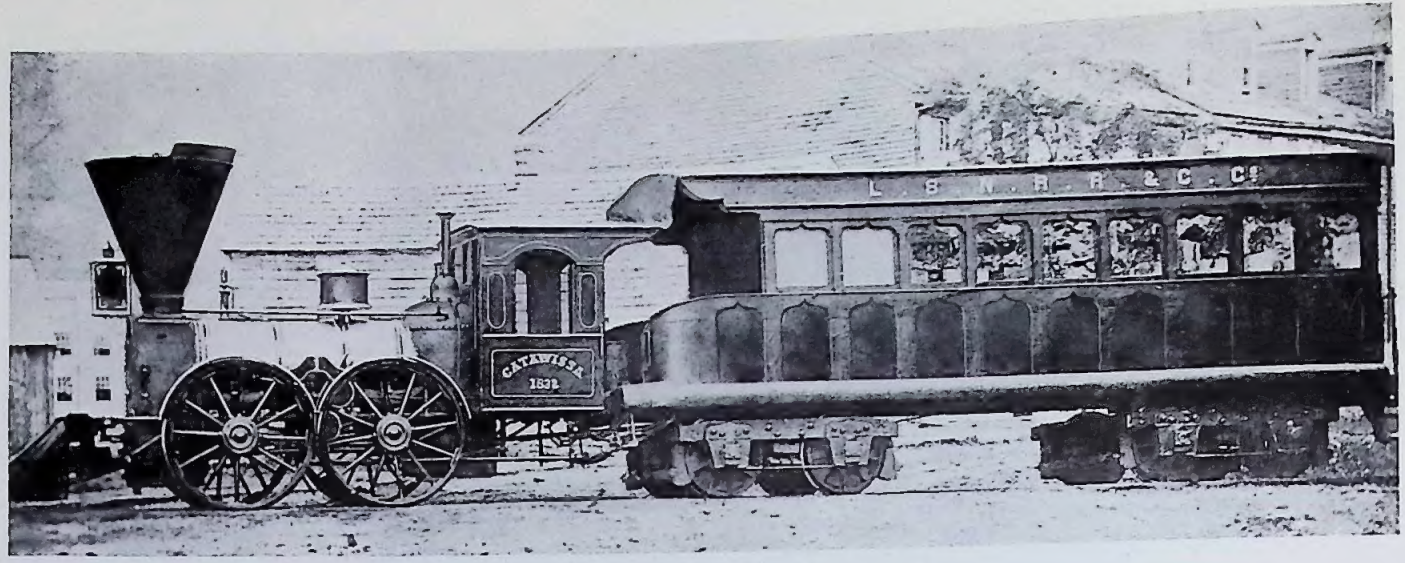
His career as a builder of railroad locomotives began in 1832, when the Philadelphia, Germantown and Norristown Railroad ordered a locomotive for use on its line from 9th and Green Streets, Philadelphia, to Germantown, Pennsylvania. Mr. Mason had retired from the partnership, and Mr. Baldwin undertook the job of building the locomotive. It was delivered in November, 1832, and christened *Old Ironsides.* It was built under such great difficulties that, after it was completed, Mr. Baldwin is reputed to have said, "This is our last locomotive."

The tender of *Old Ironsides,* as shown in this model, was merely a four-wheeled platform with wooden sides encasing an iron, box-like water tank.

Horses furnished the motive power from the official opening of the Philadelphia, Germantown and Norristown Railroad on June 6, 1832, until *Old Ironsides* arrived on the road. On Friday, November 23, 1832, the locomotive was successfully tried, and on the following Monday it was put into regular service, replacing some of the horse-drawn passenger trains. However, a public notice of that event reads, ". . . the locomotive . . . will depart daily, when the weather is fair . . . and cars drawn by horses will depart . . . at the hours when the weather is not fair." Records indicate that *Old Ironsides* was used on the Philadelphia, Germantown and Norristown Railroad until 1846, when it was apparently sold. The *Public Ledger* (Philadelphia), dated January 18, 1869, notes the ". . . engine is still in existence in Vermont." Its subsequent history is in doubt.

Old Ironsides in service.



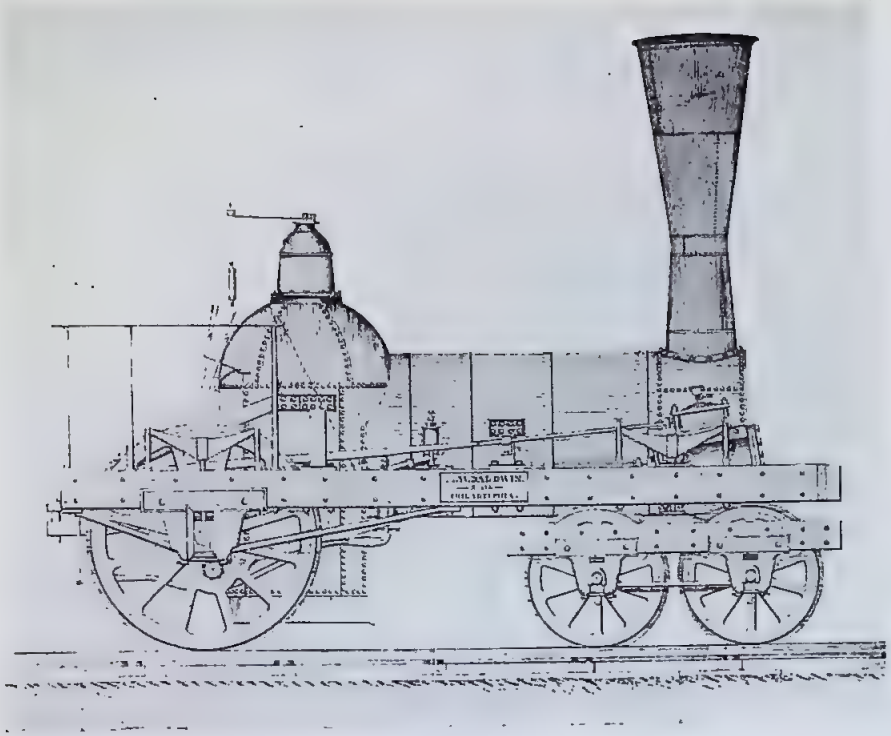


CATAWISSA

The *Catawissa*, with a sister engine, the *Comet*, was ordered from Edward Bury of Liverpool, England, by the Little Schuylkill Navigation Railroad and Coal Company. The *Catawissa*, costing $5000, was delivered at Philadelphia in February, 1833, and was hauled by team to Port Clinton, as the Schuylkill Canal was then seasonably closed to navigation.

On February 27, 1833, the *Catawissa* made its first run on a trial round trip from Tamaqua to Port Clinton. Invitations were issued to the public to witness another experimental trip on March 9, but the engine was derailed along the line and horses were dispatched to pull it to Tamaqua for repairs. Finally, on April 9, 1833, the engine was placed in regular service between Tamaqua and Port Clinton, a distance of 22 miles.

This photograph illustrates the *Catawissa* at Tamaqua between 1858 and 1862 after the engine had been partially rebuilt. The Little Schuylkill Navigation Railroad & Coal Company was leased by the Philadelphia and Reading Railroad in April, 1863, hence the *Comet* and the *Catawissa* were the only Bury built locomotives to run on any part of the Reading System. The *Catawissa* was finally sold on November 17, 1871, to the American Dredging Co.



NEVERSINK

This locomotive, the first to run on the Philadelphia and Reading Railroad, was built in 1836 by M. W. Baldwin, being the 40th locomotive constructed in his shops. It was delivered sometime in 1837, but did not enter regular service until April, 1838. The general design is illustrated by the above drawing, the original of which was made by Henry R. Campbell, Chief Engineer of the Philadelphia, Germantown & Norristown R. R.

The *Neversink*, representing a general type built by Baldwin during the years 1834 to 1842, was a 4-2-0 with a leading four-wheeled truck and a single pair of driving wheels back of the firebox. The cylinders were inside, connected to a half-crank axle, the crank pin being inserted directly in the wheel center so the wheel itself might serve as the outer arm of the crank. The engine burned wood and was equipped with a firebox of the Bury or hay-stack pattern.

The *Neversink* had 10½" x 16" cylinders and 54" drivers. It weighed 22,950 lbs., in working order, and carried 12,198 lbs. on the drivers. The steam pressure was 120 lbs.

On March 12, 1839, the *Neversink* hauled a train of 44 single cars and one double car from Reading, Pa., to Bridgeport, Pa. The total weight of the train, including the engine and tender, was 223 tons, and the length of the entire train, 595 feet. The 40-mile trip was made in 3 hours and 56 minutes, including stops, and the average speed was 12¾ miles an hour. 1.3 cords of wood and 995 gallons of water were consumed.

The *Neversink* was rebuilt into an 0-6-0 locomotive in 1846. Later that year it was destroyed by an explosion.

ROCKET

The *Rocket*, built by Braithwaite, Milner and Company, of London, England, had 10½" x16" cylinders, 41¾" drivers, and a wheel base of 4 feet 10 inches. This locomotive, weighing 8.4 tons, was a wood burner capable of developing 25 horsepower and was one of eight Braithwaite locomotives purchased by the Philadelphia and Reading Railroad Company from 1838 to 1841.

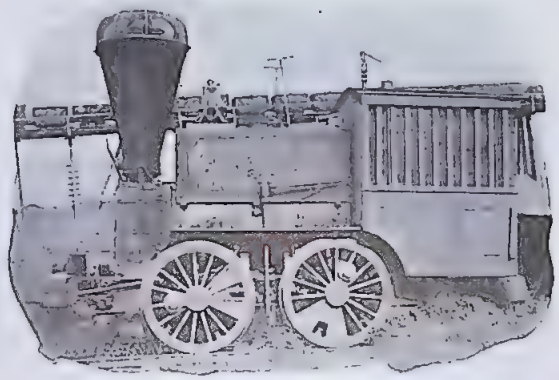
The *Rocket* and two remaining engines of her class were altered to anthracite coal burners in 1862.

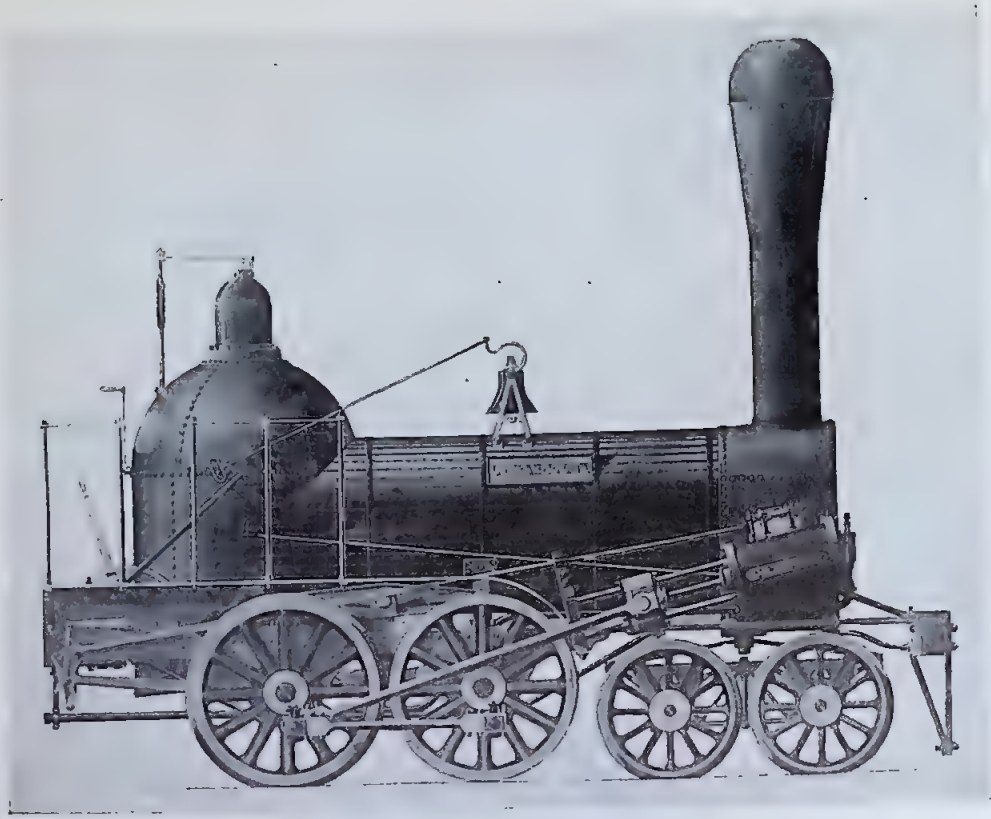
It was one of the Reading's first locomotives and was delivered to the Port of Philadelphia in March, 1838. It was carried by boat on the Schuylkill Canal to the foot of Penn Street in Reading, Pa., from whence it was hauled by horses to the terminus of the Reading-Pottstown Line at Seventh and Penn Streets. It participated in the opening of this portion of the line in May, 1838.

The *Rocket* was first used in passenger service in July 1838, but with the advent of heavier motive power in the early 40's, it was assigned to the Construction and Roadway Department by 1845. The engine remained in this service until 1865, when for a short time it "assorted cars" at Reading, Pa., and was finally transferred to Richmond Wharves, at Port Richmond, Philadelphia, where the *Rocket* worked until retirement in March 1879.

At Reading the *Rocket* stood neglected until the World's Columbian Exposition in 1893, when it was placed in condition for exhibition and permanent preservation. In 1904 it was displayed at the St. Louis Exposition and shortly afterward housed at the Reading's Columbia Avenue Station in Philadelphia, where it remained for many years. It was again exhibited in 1927 at the Fair of the Iron Horse, Halethorpe, Md., commemorating the hundredth anniversary of the chartering of the Baltimore & Ohio Railroad, and afterward stationed at Reading Terminal, Philadelphia. In 1933 it became a permanent exhibit in The Franklin Institute, Philadelphia.

The *Rocket* is shown in the illustration below, as rebuilt into an anthracite coal burner in 1862. At that time a cab and side rods connecting the two pairs of wheels had been put on the locomotive. Previous to its exhibition in Chicago in 1893, the cab and rods had been removed, restoring the locomotive to its original condition.





GOWAN & MARX

This locomotive was built by Eastwick & Harrison, of Philadelphia, in 1839, and was placed in service on the Philadelphia and Reading Railroad in January 1840. According to Joseph Harrison, Jr., one of the partners in the firm of Eastwick & Harrison, the engine had 12½" x18" cylinders and 42" drivers. The Bury firebox had a grate area of 10 square feet and the locomotive also had equalizing beams which were invented and patented by Mr. Harrison on April 24, 1838. This was

one of the most important basic improvements ever made in locomotive design, for by using these beams it was possible to build coupled locomotives that were sufficiently flexible to operate safely on the poorly surfaced tracks of the period.

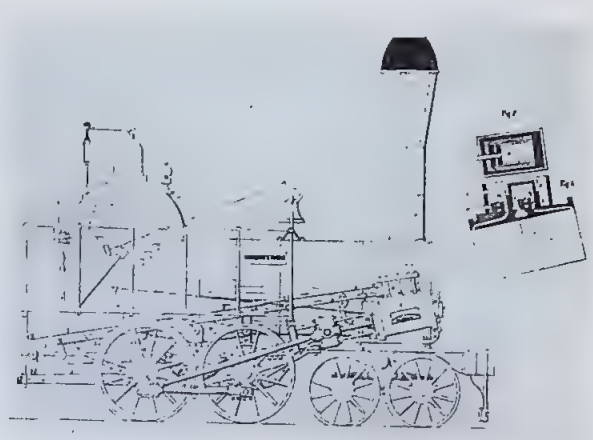
When the *Gowan & Marx* was ordered from Eastwick & Harrison, the Philadelphia and Reading Railroad stipulated the engine should weigh 11 long tons, with 9 tons on the drivers. This requirement was met by placing the firebox over the rear driving axle and using a short wheel base.

According to a report made by G. A. Nicolls, Superintendent of Transportation of the Philadelphia & Reading Railroad, dated February 24, 1840, the *Gowan & Marx* on February 20 had pulled a train 40 times its own weight on a trial run from Reading, Pa., to Philadelphia, Pa. This train consisted of 101 four-wheeled cars, or a total weight of 423 tons, including the weight of the engine. The average speed for the entire trip was 9.82 miles per hour and 5600 lbs. of red ash anthracite and 2774 gallons of water were consumed by the locomotive. This was one of the earliest experiments in burning anthracite. Mr. Nicolls says, "The steam ranged from 80 lbs. to 130 lbs. per square inch, to which latter pressure the safety valve was screwed down."

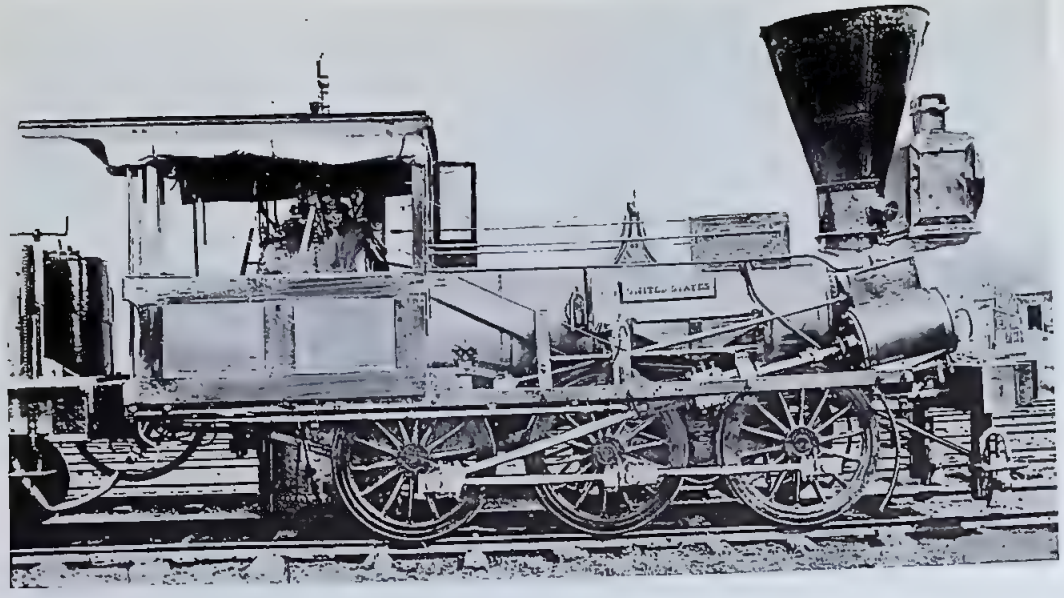
The *Gowan & Marx* became famous over the entire world for this performance and attracted the attention of two Russian Railway Commissioners who had been ordered by Emperor Nicholas I to report on American and European railroads. Evidently the *Gowan & Marx* more than satisfied these officials for in 1844 the firm of Eastwick & Harrison closed its doors in America and moved to Russia, there joining with Thomas Winans to establish the firm of Harrison, Winans & Eastwick. Using the *Gowan & Marx* as a model, this firm built the motive power for the new railroad from St. Petersburg to Moscow which was then under construction by order of the Emperor.

The Philadelphia and Reading Railroad, owing to the success of the *Gowan & Marx,* ordered 12 more locomotives of the same general design in 1842 from the Locks and Canals Company of Lowell, Mass. These were delivered in the summer of 1843.

From 1847 to 1858 the *Gowan & Marx* was used at Reading Depot and in 1859 worked at Lebanon, Pa. Finally, in 1860 the locomotive was exchanged with M. W. Baldwin in part payment for a new locomotive, the *Active,* shown on page 34.



This old drawing shows the Gowan & Marx as it was originally built with Eastwick reversing mechanism. This consisted of a sliding block with two sets of passages through it, which was placed under the slide valve in the steam chest. The block was connected to the reverse lever on the foot board and by moving it, steam could pass to the cylinder through either one or the other of the sets of passages, thus determining the direction in which the locomotive operated. The drawing on the opposite page shows the locomotive as partially rebuilt without the sliding block, and with a hook-motion valve gear.

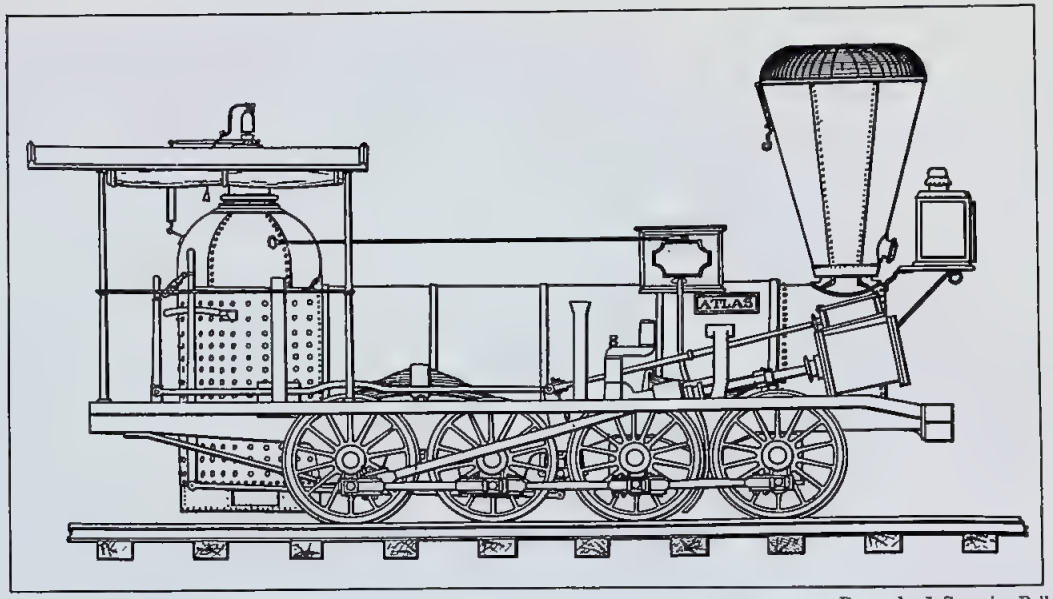


UNITED STATES

BALDWIN FLEXIBLE BEAM TRUCK LOCOMOTIVES

The *United States* was one of twelve wood-burning locomotives built for the Philadelphia and Reading Railroad by the Baldwin Locomotive Works in 1844 and 1845. This was the first large order placed by the railroad with M. W. Baldwin. These locomotives were all of the 0-6-0 type with 15″ x 18″ cylinders and 46″ driving wheels. The weight in working order was 18.6 tons. They were fitted with the Baldwin flexible beam truck, an ingenious device which permitted the first and second pairs of wheels to move laterally across the track, one pair to the right and the other to the left, or vice versa. The side rods had spherical brasses forming ball and socket joints accommodating themselves to the lateral movement of the wheels. This innovation enabled the locomotives to traverse sharp curves and, as all the weight was carried on the drivers, the engines could haul a heavy load in proportion to their size. These 12 locomotives were followed in September, 1845, by another, the *Champlain*,

ATLAS

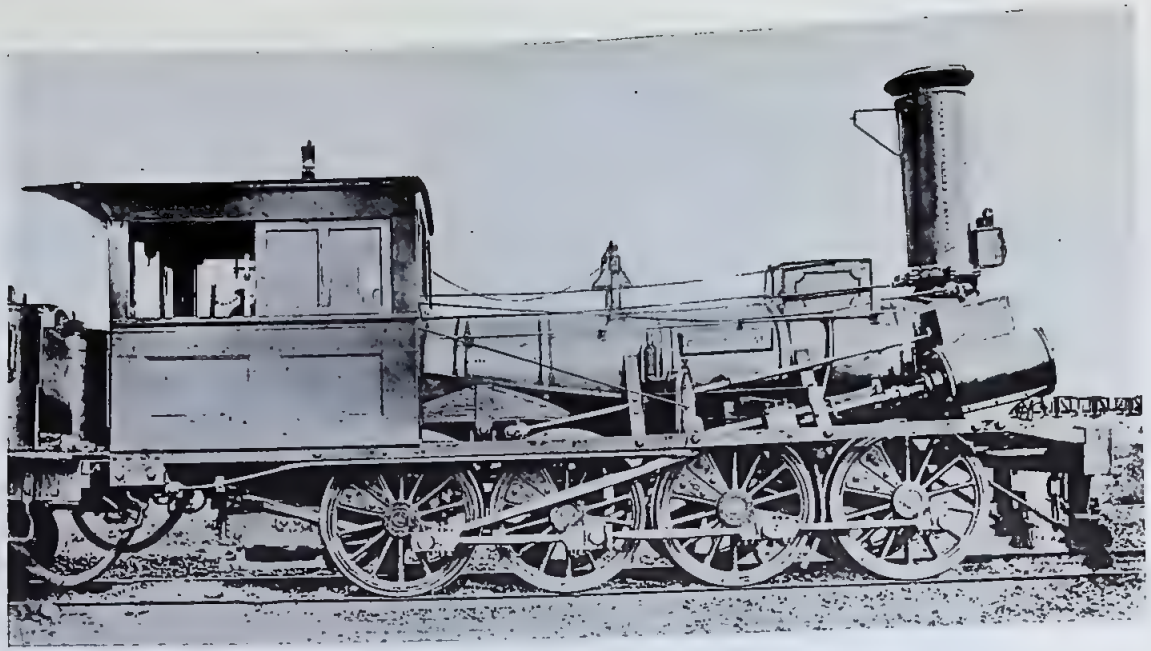


Drawn by J. Snowden Bell

which was of similar design but had larger cylinders and weighed approximately 20 tons.

The illustration shows the *United States* with a cab, which was applied later, in place of an open platform with a railing to protect the crew. The locomotive operated in the "coal trade" until 1854 and, from that time until its retirement in 1872, was employed on the Main Line wood train, Roadway Department, and in switching service at Phoenixville and Reading. In 1848 the locomotive was experimentally fitted to burn bituminous coal.

The flexible beam truck mentioned above was patented by M. W. Baldwin, and contributed largely to his success as a locomotive builder. Two classes of 0-8-0 type locomotives fitted with these trucks were built by Baldwin's in 1846 for the Philadelphia and Reading. The *Atlas*, pictured above, and the *Hercules*, represent the first of these two classes. Placed in service on the Philadelphia and Reading in 1846, the *Atlas* had 17¼" x 18" cylinders, and 42" drivers, and weighed 27 tons in working order. These two engines were built specially for the Falls Grade near Philadelphia, the only southbound opposing grade on the Main Line of the Reading System, between the coal regions and tide-



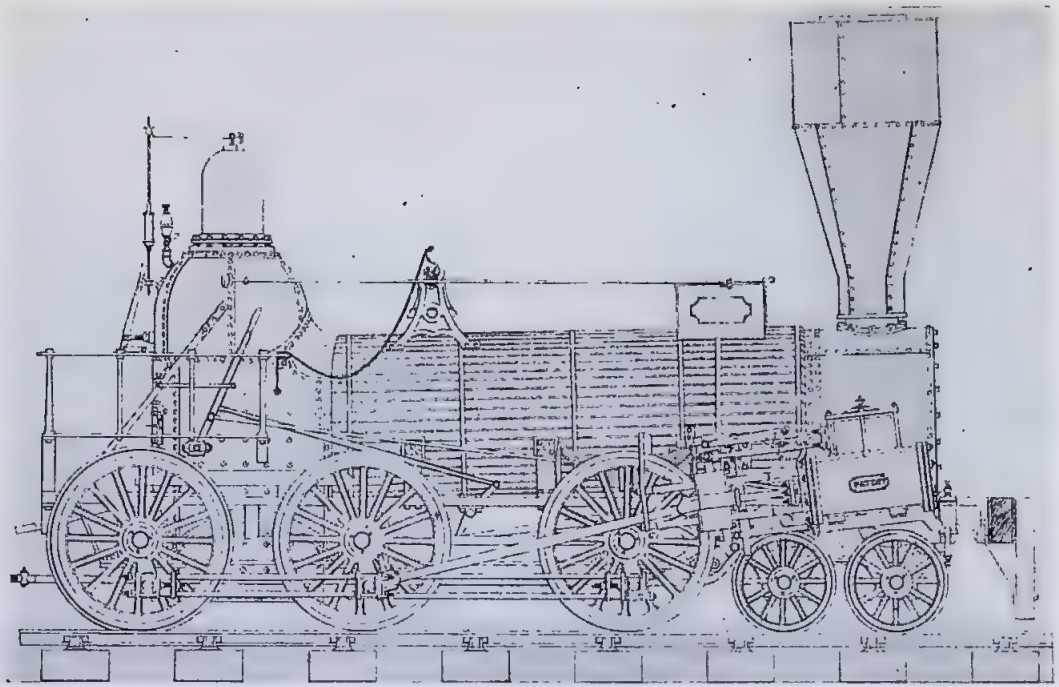
POCAHONTAS

water, where helper service is needed. They remained in this service until rebuilt in 1861, and were finally retired in 1878 and 1879, respectively.

These two were the first Baldwin engines to be equipped with sand boxes, and with roofs for the protection of the engine crew. These roofs were built on iron posts and the enginemen added curtains on the sides and front. Cabs had been adopted previously in New England, owing to the severity of the climate, but had never before been adopted by Baldwin.

The *Pocahontas*, above, was one of a class of 15 locomotives built by Baldwin in 1846. All of these were fitted with the flexible beam truck and weighed 22.4 tons, which was considerably lighter than the *Atlas* and *Hercules*.

The picture above shows the *Pocahontas* after rebuilding by Baldwin in 1855, and subsequently fitted with the standard Millholland stack of the Civil War period. It was built for the "coal trade," and was used in that capacity until rebuilt. It was last employed as a switcher at Reading and was retired in 1874.

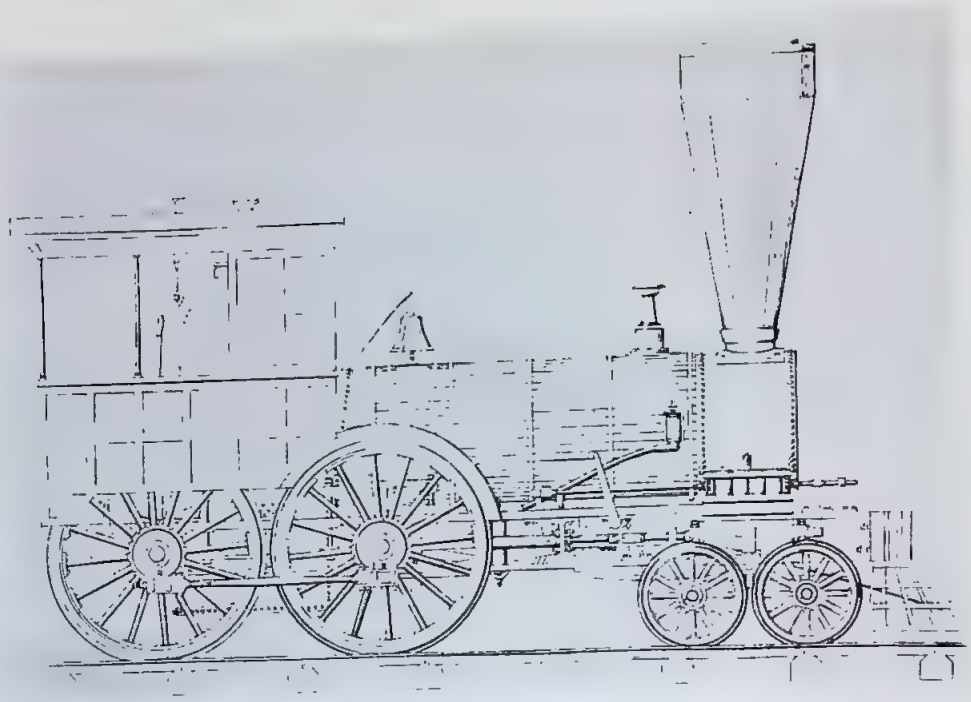


CHESAPEAKE

This locomotive was built by the Norris Locomotive Works, 17th and Buttonwood Streets, on what was known as Bush Hill, Philadelphia. It was completed in 1847 under a patent granted to Septimus Norris. The boiler had a Bury firebox, the cylinders were 14½" x 22" and the drivers were 46" in diameter.

The *Chesapeake* was the first locomotive of the 4-6-0 or ten-wheel type to be built in the United States. It proved a success and established a type which is still extensively used. In Main Line service, the 4-6-0 has been replaced by locomotives of greater capacity, but ten-wheelers are today doing excellent work in branch line local freight and passenger service on the Reading and many other railroads.

In 1849 the *Chesapeake* was rebuilt by the Philadelphia and Reading and continued in the "coal trade." It served in this capacity until June, 1861, when it was again rebuilt into practically a new engine. It was scrapped in 1881.

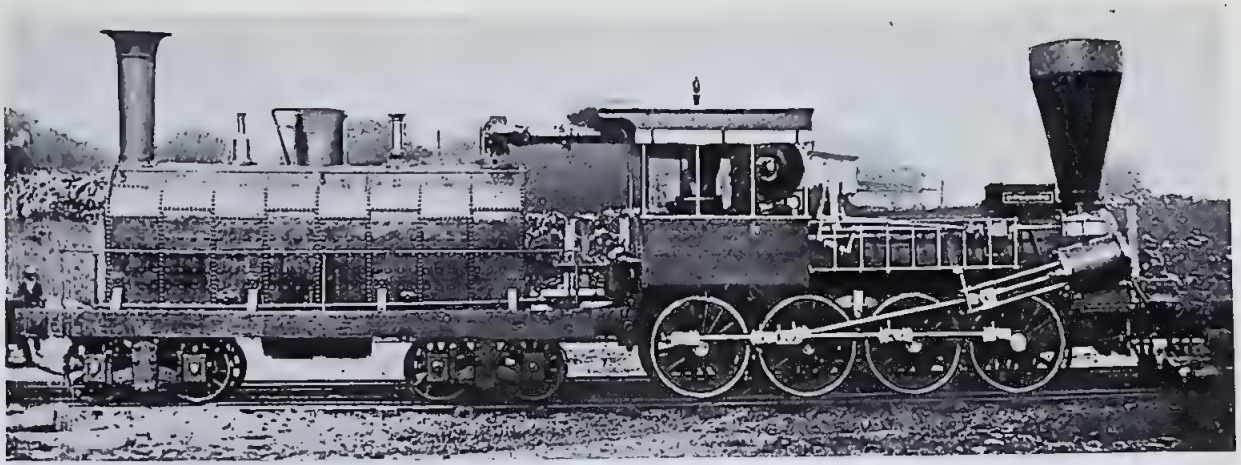


LEWIS KIRK LOCOMOTIVES

This original drawing is captioned in longhand "Passenger Engine built at Reading Railroad Depot by Lewis Kirk, May, 1848." The name of the locomotive has not been recorded. However, an exhaustive search through motive power records identifies the above drawing as one of three engines, namely, *Buena Vista*, *Vera Cruz*, or *Cerro Gordo*. These were the first passenger locomotives built by the Philadelphia and Reading Shops, at Reading, Pennsylvania. Their Mexican names were due to the war fever in 1848. The engines were not particularly successful, and were soon sold.

Lewis Kirk, who made the drawing illustrated here, took charge of the shops at Reading, Pennsylvania, October 1, 1843, and succeeded Thomas D. Simpson, the Reading's first Master of Machinery, who was transferred to the new engine house at Port Richmond. Kirk, who came from Lowell, Massachusetts, introduced on the Reading the inside connected locomotive shown above, which was similar to many locomotives in New England at that time.

Kirk's notable career with the Philadelphia and Reading extended only five years. During that time he began rebuilding old locomotives and constructing new ones at Reading, a practice followed continuously to the present time. The shops were extensively enlarged and improved under his direction, and early in 1845 a forge was erected for the manufacture of locomotive tires. Prior to this time American mechanics were wholly dependent upon manufacturers in Great Britain for the supply, and a single domestic source which was negligible.



NOVELTY

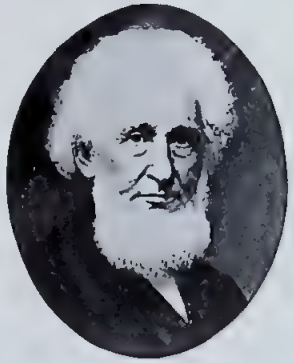
G. A. Nicolls, Superintendent of Transportation of the Philadelphia and Reading, conceived the above engine, believing that an exceptionally large firebox would burn anthracite successfully. The details were worked out by Lewis Kirk, who was foreman of the Reading Shops when the engine was built there in 1847.

As it was believed that a boiler of sufficient size to burn anthracite could not be placed on a locomotive of the usual type, the boiler of the *Novelty* was carried on a separate vehicle apart from the machinery. The boiler proper, with a straight stack, is seen on the left-hand vehicle in the above illustration. The boiler-like section on the right-hand vehicle was a steam reservoir which received the steam from the boiler proper through a jointed pipe. The cylinders exhausted into a condenser, and forced draft for the fire was furnished by a blower discharging into the ash pan. This unique plan was never developed on later engines. The boiler was of the return tubular type, and had a grate area of 36 square feet and a heating surface of 1085 square feet. The engine was lacking in adhesion, and the boiler details were badly designed and gave much trouble in service. Although an interesting experiment, the locomotive made practically no contribution to the development of the Reading motive power.

In 1849, only two years after it was built, the *Novelty* was withdrawn from service and was used to operate a saw mill.

THE WINANS LOCOMOTIVES

Conspicuous among the early locomotive builders was Ross Winans, who has been characterized as "one of the strongly marked men of his generation." He was born in Vernon, New Jersey, on October 16, 1796, and at an early age showed inventive genius and great interest in steam-propelled machinery. Mr. Winans is mentioned as Assistant Engineer of Machinery in the Fifth Annual Report of the Baltimore and Ohio Railroad, in 1831. Shortly afterward he entered into partnership with George Gillingham, under the firm name of Gillingham and Winans, and took over the Baltimore and Ohio Shops at Mount Clare, Baltimore, where the firm built and repaired locomotives and cars.



Ross Winans

About 1843, Mr. Winans erected in Baltimore what was then considered to be the largest locomotive building establishment in the country. Here he built locomotives until 1860, and established a great reputation due to the power of his engines and the ingenuity of his designs.

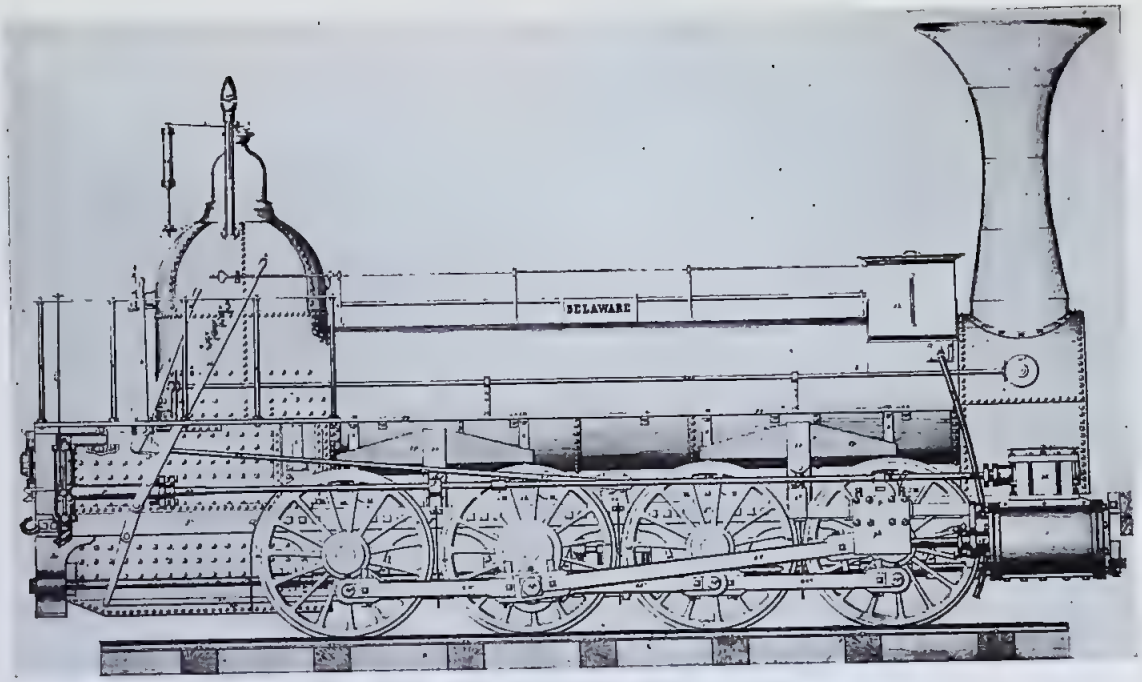
Early in 1838 the firm of Gillingham and Winans completed a locomotive named *Delaware* for the Philadelphia and Reading. This locomotive had a vertical boiler and was designed to burn hard coal. It weighed 10.1 tons and was similar to the well-known "Crab" locomotives built by Winans for the Baltimore and Ohio. As a hard coal burner it was not successful, and was apparently withdrawn from service in 1845 after making only 1,586 miles, according to the Company's Annual Reports.

In 1847, Winans built four large freight locomotives for the Reading. The *Baltimore* was first run in June and the *Maryland*, *Delaware* (replacing the first locomotive of that name) and *Ohio*, were completed in September. These heavy freight locomotives were of the 0-8-0 type, the four pairs of driving wheels being placed as close together as possible. The wheels were 46" in diameter and the cylinders 18" x 22". The boiler, designed to burn hard coal, had a firebox of the Bury or "haystack" pattern with a rearward extension, by means of which a grate area of 17.68 square feet was provided. With their comparatively large fireboxes, these locomotives burned anthracite more successfully than any previously built. For this reason the Reading, in 1849, paid Winans a bonus of $500 per locomotive in addition to the original purchase price.

As built, these engines carried an excessive amount of weight on the rear pair of driving wheels. This was objectionable, and Winans applied a pair of small pony wheels under the firebox to relieve the drivers of the excess. The drawing on the opposite page shows the second *Delaware* as originally built.

The "Camel" Locomotives

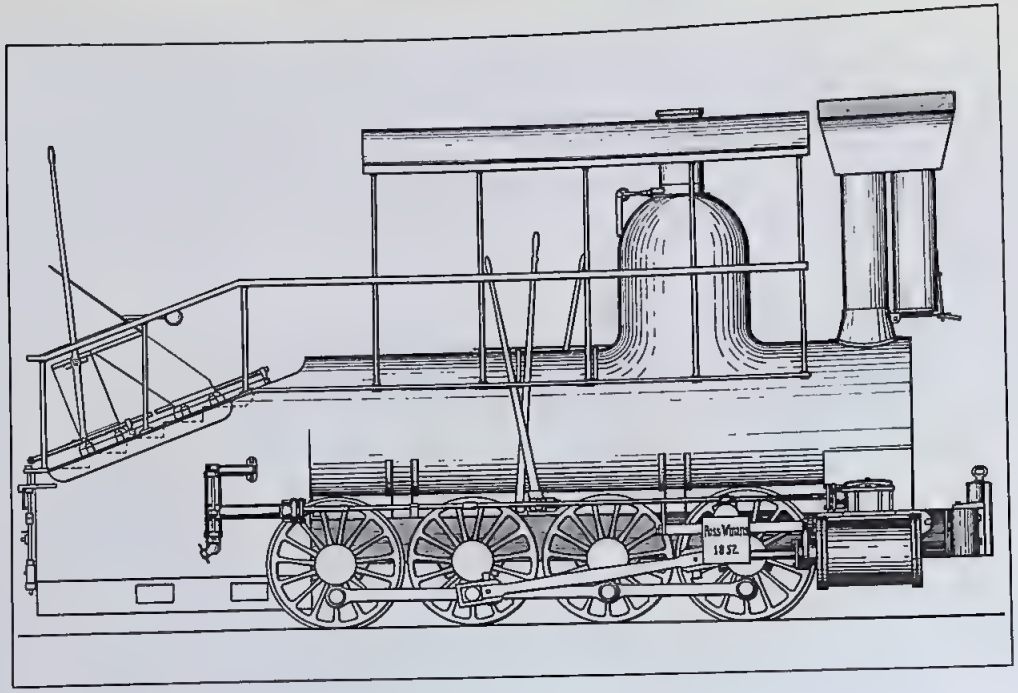
Large numbers of the Winans "Camels," as illustrated on page 22, were built for various railroads during the years 1847 to 1860. As far as their design was concerned these were among the most original and peculiar locomotives of the period, and because of the odd cab position over the boiler, these engines were known as "Camels." A total of 47 were placed in service on the Reading during the years 1847-1855. The majority of these locomotives had



DELAWARE

19″ x 22″ cylinders, and the driving wheels of all were probably 43″ in diameter. The "Camel" design of boiler had a long overhanging firebox placed back of the rear driving axle, with sloping crown and roof sheet and two "firing chutes" on top for spreading coal over the grate. A fire-door was also placed at the rear. At the forward end of the boiler was a large dome, and a cab, provided with side curtains, extended over the greater part of the boiler barrel. The valve gear, with its eccentrics, cams and drop-hooks, was most original in design; there being a separate cam for cutting off steam at half-stroke.

As first built the "Camels" had cast iron grates, and there was no water space at the back of the firebox. The grates



WINANS' "CAMEL"

burned out rapidly; and to remedy this, James Millholland, later Master of Machinery of the Philadelphia and Reading, fitted a water space in the rear, and installed water-tube grates, which proved successful. The locomotives were rather crude in construction and expensive to maintain, but with their large boilers and fireboxes they steamed freely and demonstrated the advantage of ample boiler capacity in a locomotive intended for heavy duty.

LOUISIANA

The *Louisiana* is shown as considerably modified from the original Winans engine which cost $9750 when built in November, 1850. The photograph was taken during the late 1860's after Millholland's characteristic straight stack had been applied. The *Louisiana* was rebuilt into what was practically a new locomotive in September, 1869, weighed 30.3 tons and was numbered "251" in December, 1871. It was destroyed in August, 1891.

JAMES MILLHOLLAND and his ANTHRACITE-BURNING LOCOMOTIVES

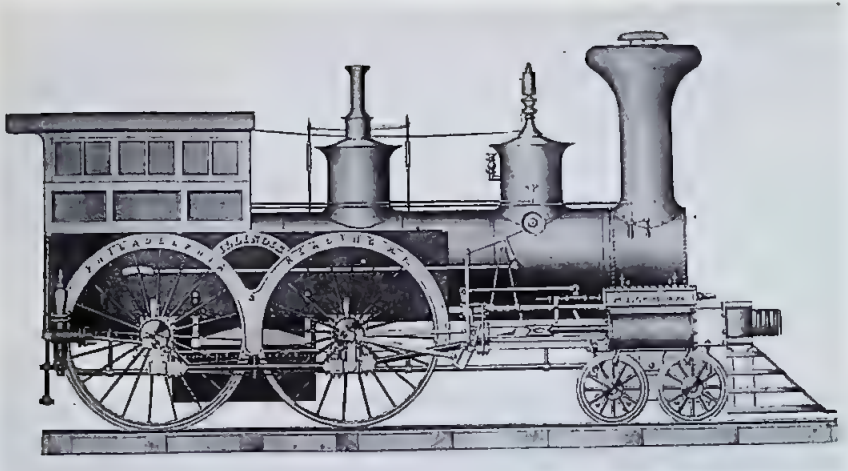
In 1848 the Motive Power Department of the Philadelphia and Reading Railroad was placed under the supervision of James Millholland, who was appointed Master of Machinery, succeeding Lewis Kirk. Millholland was born in Baltimore, Md., on October 6, 1812, and showed early proficiency in mathematical and geographical studies. He assisted in the construction of the *Tom Thumb*, the first railway locomotive built in the United States, placed in service on the Baltimore and Ohio Railroad in 1830. While connected with the Allaire Iron Works of New York, he had valuable experience in the design and construction of marine engines. He made many valuable improvements in locomotive design during the 18 years he was connected with the Reading.

JAMES MILLHOLLAND

In 1852, Millholland patented a boiler which was especially designed to burn anthracite fuel. It had two sets of tubes separated by an intermediate combustion chamber, and various other special features. This boiler, in modified form, was applied to the freight locomotives of the *Pawnee* class, which were first built at the Reading Shops in 1852. The *Pawnee* class is represented here by the *Tennessee*. These locomotives were of the 2-6-0 type, with a single pair of leading wheels placed back of the cylinders and held rigidly in the main frames. The boiler had two steam domes, with a double-seated throttle valve in the forward dome. The valve gear was of the Gooch type, with suspended links; and there were double slide valves in the steam chests, the steam passages being as short as possible.

Contemporary with the *Pawnees* were two fast passenger locomotives, the *Illinois* and the *Michigan*. These were of the 4-4-0 type with driving wheels seven feet in diameter, which were of wrought iron, forged by hand in the Reading Shops. The Stephenson link motion was applied, with the links placed outside the connecting rods and operated by double return cranks instead of eccentrics. The accompanying illustration on the opposite page, which is reproduced from a drawing of the *Illinois*, shows some of the interesting features of the design.

Both the *Pawnee* and *Illinois* classes represented admirable workmanship and well designed details. However, the boilers, with their intermediate combustion chambers and other special features, did not steam satisfactorily. Millholland profited by his experience with these locomotives, and his subsequent boiler designs, which were far simpler, showed a great improvement in efficiency and steaming capacity.



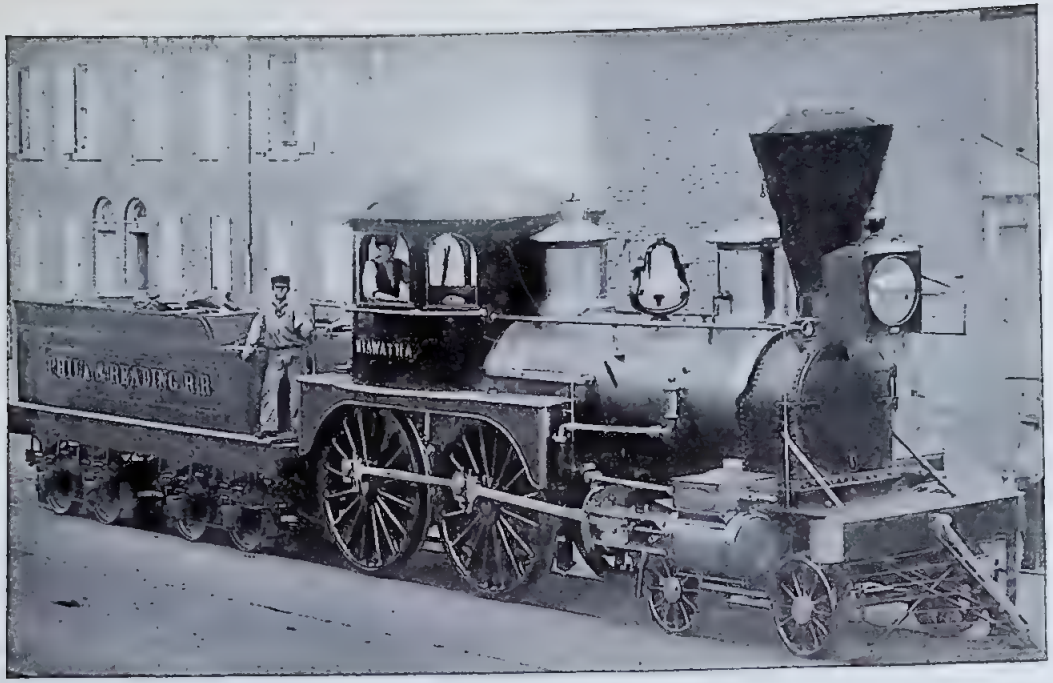
ILLINOIS

The *Illinois*, built by the Philadelphia & Reading Shops in May, 1852, weighed 27.7 tons. A duplicate locomotive was named *Michigan*. These locomotives had forged iron driving wheels seven feet in diameter, and an unusual arrangement of Stephenson link motion, driven from a double-return crank and placed outside the rods. This was possibly the first application of an outside motion.

The *Illinois* was run on Main Line Passenger trains from 1852 to 1856, and on the Main Line Market Train from 1857 to 1860. In 1861 it was rebuilt into a new locomotive.

TENNESSEE

The *Tennessee*, weighing 26.9 tons, was built by the Philadelphia and Reading Shops at Reading in November, 1852. It was one in a series of six, and was used exclusively in the "coal trade" from 1852 to 1859. In the following years before retirement in 1869, this locomotive ran on the Lebanon Valley, Lateral Railroads, and Roadway Department trains. The illustration shows the locomotive when partially rebuilt with a straight stack and other minor changes.



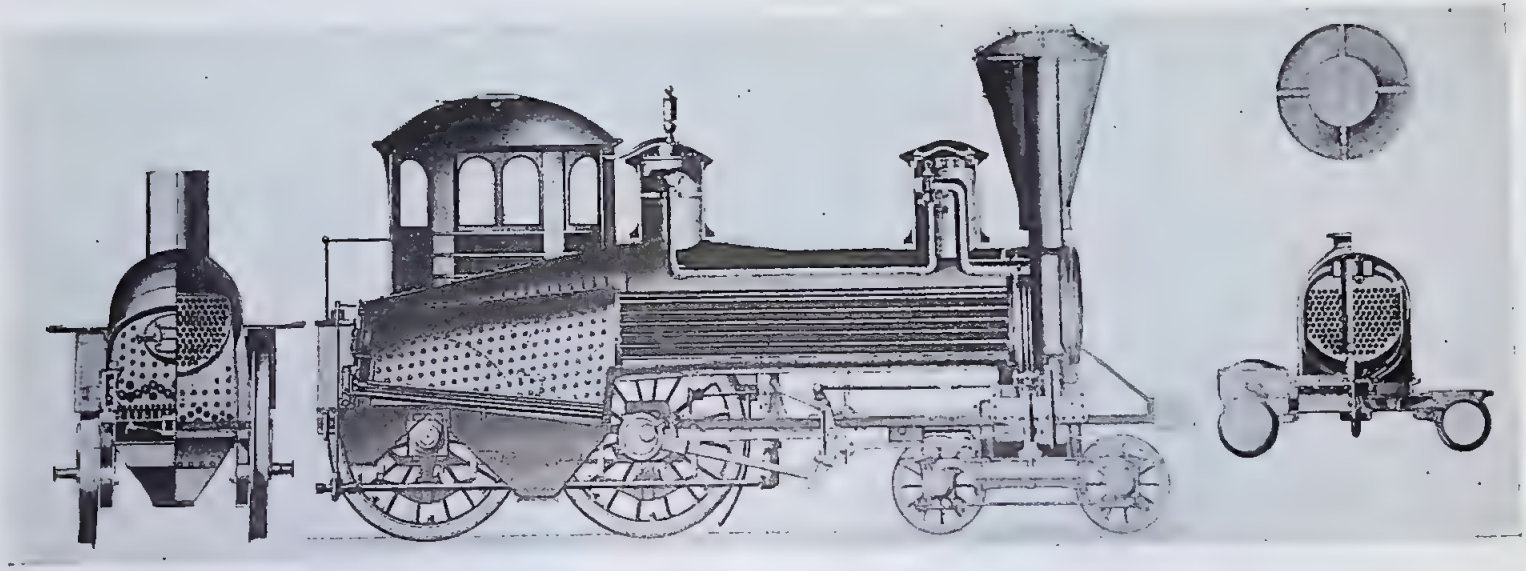
HIAWATHA

In 1859 the passenger locomotives *Hiawatha* and *Minnehaha,* designed by Millholland, were built at the Reading Shops. The esteem in which these locomotives were held is indicated by a statement by Superintendent G. A. Nicolls, dated November 30, 1859, which states "the two new coal-burning passenger engines *Hiawatha* and *Minnehaha* have been completed and in use for some months. In economy of fuel and repairs, and general efficiency, these locomotives have proved superior to any yet used, and are believed to furnish an excellent model for others which may be hereafter required for similar service."

The boiler of the *Hiawatha* had a firebox seven feet long, placed above the engine frames. There were two steam domes, the rear dome being placed forward of the firebox. The steam supply for the cylinders was drawn from both domes, there being a double-seated throttle valve in the forward dome. The crown of the firebox sloped sharply to the rear, and the grate was com-

posed of water tubes. The driving springs were hung below the axles and there was an excellent design of Stephenson valve motion, with the links suspended from above. A variable exhaust nozzle, which was frequently used at that time in coal burning locomotives, was applied, and the stack had a straight inside pipe and was surrounded by a funnel-shaped casing for catching sparks and cinders. The smokebox had straight sides and a flat bottom, and was seated on the cylinder castings, which were bolted together on the center line of the locomotive. The cab was of iron with rounded corners and a rounded roof, and this initiated a type of cab which was used by Millholland on many of his locomotives. The engine weighed 25.2 tons.

The *Hiawatha* established a general design of locomotive which continued until the advent of the "Wootten" boiler in 1877. It was employed in Main Line passenger service until about 1867 at which time it was transferred to the Lebanon Valley Railroad and East Pennsylvania Railroad (The Allentown Line). On November 30, 1880, the *Hiawatha* held the Reading mileage record by running 720,727 miles; having run over 51,000 miles in 1880 alone. It was retired in 1883.



Sectional Views of the Hiawatha

FAWN

The *Fawn*, a light passenger locomotive of the 4-4-0 type, was built at the Reading Shops in December, 1860. This locomotive was rated as weighing 18 long tons in working order, and was suitable for branch line and local service. It had various features in common with the *Hiawatha*, but with a shorter boiler and only one steam dome. It was given the number "64" in December, 1871, when names were abandoned. The engine was withdrawn from service in 1882 when Wootten boiler locomotives were being built in large numbers. It was destroyed in 1888.

KOSCIUSKO

The *Kosciusko* was built at the Reading Shops in February, 1865, and was a Main Line passenger engine weighing 25.2 tons. It was of the same general design as the *Hiawatha*. A difference is noted in the stack, the funnel shape casing being omitted in the *Kosciusko*. The device near the top of the stack was a slide for checking the draft. The brass casings on the cylinders and steam domes, and the landscape scene on the headlight, indicate the extent of decorative features applied to these old locomotives.

The *Kosciusko* was numbered "143" in December, 1871, retired in 1883 and destroyed in October, 1888.

WINONA

The *Winona*, built at the Reading Shops in November, 1866, was of the same weight as the *Kosciusko*, and closely similar to it in design. The illustration shows how the smokebox was seated on the cylinder castings. It also presents a wooden cab, which may not have been the one originally applied. As in the majority of the locomotives designed by Millholland, the sandboxes were placed in the wheel covers under the running boards.

The *Winona* was given the number "190" in December, 1871, and was retired in 1883.

NEVADA

MILLHOLLAND'S "GUNBOATS"

In 1863, Millholland introduced a new design of freight locomotive, more than a hundred of which were built during the next 10 years. These locomotives were popularly known as "gunboats." They were of the ten-wheel or 4-6-0 type, with a four-wheel leading truck, and in all respects were a great improvement over the *Pawnee* class. The boiler design was similar to that of the *Hiawatha,* with the firebox over the frames and two steam domes. The *Nevada,* first of the series, was built at the Reading Shops in March, 1863.

The illustration shows a form of guide frequently used by Millholland on freight locomotives. This was a two-bar design, with round bars which passed through cylindrical openings in the crosshead. Wear was taken up by means of a packed gland, and the main rod was forked at the front end to embrace the crosshead.

The "gunboats" had cylinders 18″ in diameter, the stroke in some cases being 22″ and in others 24″. The *Nevada* had driving wheels 46″ in diameter but in many instances 54″ drivers were used.

The *Valentia* was one of ten "gunboats" built by the Baldwin Locomotive Works in 1869. As compared to the *Nevada,* certain changes in design should be noted. The cab was of wood instead of iron, the Millholland guide was replaced by a four-bar design,

VALENTIA

and instead of using two sandboxes under the running boards, there was one box on the boiler between the domes, the bell being mounted on top. The *Valentia* was rated as weighing 32.2 tons. There were also 14 other "gunboats" built by Norris Brothers of Lancaster, Pennsylvania.

This class accomplished fine work in main line freight service. They were not specially large, but with favorable grades from the coal fields to tidewater they could handle heavy tonnage.

Millholland was among the pioneers who standardized designs by using interchangeable parts where practicable in locomotives of different classes. As shown in the illustrations, there was a marked similarity between the "gunboats" and the main line passenger locomotives of the period. At the time of Millholland's retirement, in 1867, few railroads in this country had standardized their motive power to such an extent as the Reading.

Historically, the building of the "gunboat" class marked a new epoch in the Reading's motive power, and thenceforth radical progress was made in its general betterment. Prior to this the development of Reading locomotives was not so marked, and these "Millhollands," as they also were known, being successful coal burners, with good steaming and adhesive qualities, were a decided success from the very start.

IDAHO

This locomotive, built in the Reading Shops in May, 1863, was used exclusively on the Mahanoy and Shamokin Branch of the Philadelphia and Reading Railroad.

The *Idaho* was a tank engine of the 0-8-0 type, with water tanks on the top and sides of the firebox. The cab was similar to that used on the Winans "Camels." Machinery details included round guides, and knuckle-jointed valve rods with front extensions. The Millholland design of water-tube grate was applied, and brushes for cleaning the tracks were placed at each end of the locomotive.

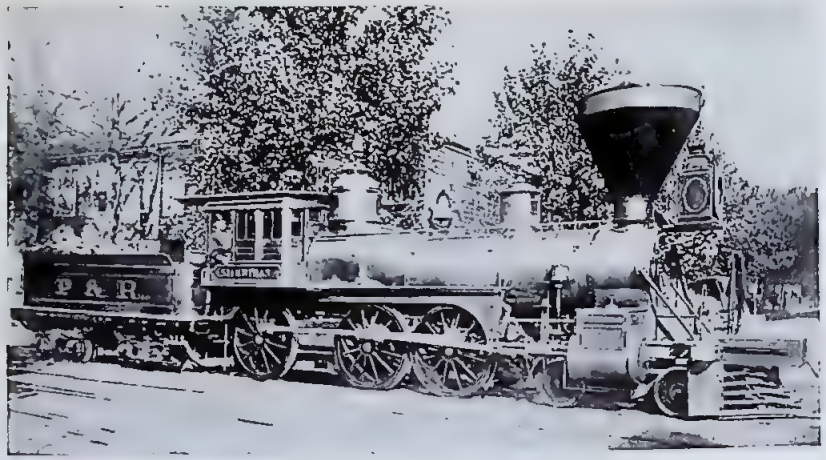
The locomotive had 18" x 22" cylinders, 36" drivers, a weight of 72,100 pounds and a total heating surface of 1,031 square feet.

In December, 1871, the *Idaho* was renumbered "85" and continued in service as a pusher until October, 1884. It was dismantled in February, 1889.

PENNSYLVANIA

This remarkable locomotive, designed by Millholland and built at the Reading Shops in 1863, was used in pusher service on the Falls Grade, Philadelphia. The *Pennsylvania* was a tank engine with six pairs of coupled driving wheels without truck wheels. The boiler, similar in many respects to the *Hiawatha* class, had two steam domes, a sloping firebox roof, with the firebox placed above the frames. The water supply was carried in one tank on top of the firebox and in two additional side tanks. No coal was carried as firing was done only at the end of each short, but strenuous trip. (The grade is 0.9% for approximately one mile). The barrel of the boiler was surmounted by a large cab, which had side curtains similar to those used on the Winans "Camels."

The *Pennsylvania* had 20" x 26" cylinders and driving wheels 43" in diameter. It weighed 100,320 pounds in working order. The engine was rebuilt in 1870 with five pairs of driving wheels: the weight being reduced about nine tons. It was used only in pushing service on the Falls Grade and was finally retired from service in November, 1885.



SHERIDAN

The *Sheridan* was one of four wood burners, purchased at a time when Millholland was designing many efficient hard-coal burning locomotives. It was built by Norris Locomotive Works of Lancaster, Pennsylvania, in March, 1865, and named after General Sheridan, of Civil War fame. The other locomotives of this series also carried names of distinguished generals of the period.

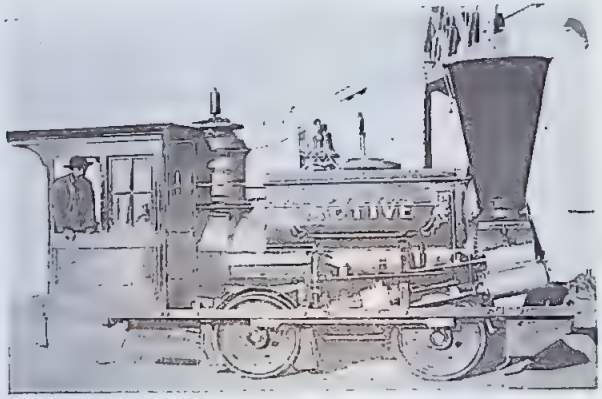
The *Sheridan* was probably reboilered during its later years. In December, 1871, the engine was numbered "152" and was renumbered "488," unclassified, in April, 1900, and sold for scrap to Poultrer & Co., Lebanon, Pennsylvania, in August, 1902.

ACTIVE

Completed in August, 1860, this was the 942nd locomotive built by the Baldwin Locomotive Works. It weighed 14.4 tons, with cylinders 11″ x 16″ and 36″ drivers. Note the striping and the ornamented panels on the tank and cab.

The water pump for feeding the boiler on the *Active* was placed slightly ahead of the rear drivers. The pump barrel served also as a crosshead guide, and the pump plunger was driven from the piston rod. This plan originated with Mr. Baldwin in 1834.

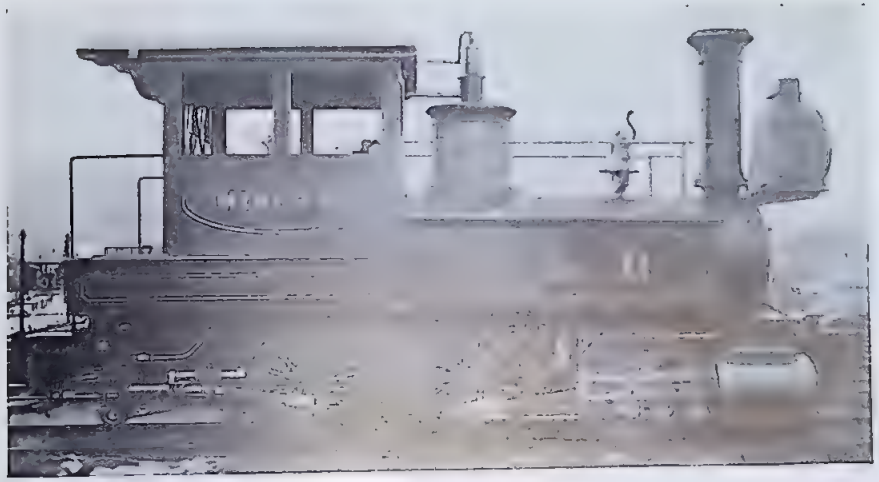
The *Active* was used mainly for assorting cars at Philadelphia and Pottstown, but occasionally worked in the Roadway Department. It was numbered "61" in December, 1871, and scrapped in March, 1886.



SABLE

Built in 1870 in the Philadelphia and Reading Shops at Reading, Pennsylvania, the *Sable* was operated at the Richmond Wharves, Port Richmond, Philadelphia. It weighed 11.5 tons and was fitted with a sandbox between the drivers.

One of eight in its class, it was numbered "270" in December, 1871, and dismantled in 1897.



MINERVA

The photograph shows this 0-6-0 switch engine as originally built by the Philadelphia and Reading Railroad in November, 1869. It weighed 27.3 tons in working order. Used first at Richmond Wharves, it later assorted cars at Reading. In 1871 the *Minerva* was numbered "258" and in 1900 renumbered "1252," Class B-1-a. It was scrapped in September, 1906.

SAXON

The *Saxon* shows several interesting features. The feed water pump is placed under the cab and is driven from a return crank on the rear crank-pin. The boiler barrel was made with a slope on the bottom ahead of the firebox, giving free entry into the firebox water space.

Millholland's design of round guide is plainly shown, also the fork in the forward end of the long connecting rod. The parallel rods had solid ends, a rather unusual construction for the period, although it was extensively employed by the Philadelphia and Reading. The slide in the smoke stack was a device for checking the draft.

The *Saxon* was built at the Reading Shops at Reading, Pennsylvania, in May, 1868, and was designed especially for hauling and pushing coal trains on heavy grades on the Mahanoy and Shamokin Branch. The locomotive weighed 38 tons in working order. The *Saxon* was retired in November, 1890.

NUMBERING AND CLASSIFYING LOCOMOTIVES

In December, 1871, the Philadelphia and Reading Railroad discontinued naming locomotives, and substituted numbers in practically all cases. While this to some extent destroyed the individuality of the locomotives, it was a far more convenient method of designating them.

In general, the locomotives were numbered consecutively according to age. Thus the *Rocket* was the oldest in existence at that time, and it was given the number 1; the *Engineer*, second in age, was assigned the number 2, and so on until all were numbered. As locomotives were subsequently retired, for any reason, their numbers were assigned to new engines. This preserved the continuity of the numbering, but the chronological unity was lost to such an extent that in April, 1900, it was decided to re-number the locomotives, assigning a block of numbers to each class. It was thus a comparatively simple matter to tell the class of any particular locomotive from its number. This system is still in use.

In classifying the locomotives, a letter of the alphabet is used to designate the wheel arrangement, and this is followed by a number to indicate a general class of locomotives having that wheel arrangement. A second letter is introduced to indicate the particular group or sub-class to which the locomotive belongs, and if it is equipped with a superheater, the letter S is included. Thus the locomotives of Classes G-1-s-a and G-1-s-b are both superheated, and are practically alike except for differences in their wheel diameters.

The following table gives the letters used in the classification system, together with the wheel arrangement and class of service. The first figure in the second column gives the number of wheels in the front truck; the second figure, the number of driving wheels; and the third figure, the number of wheels in the rear truck.

The table shown below lists the letter assigned to each type since April, 1900, the wheel arrangement, and service.

A — 0-4-0 . . . . . Switching
B — 0-6-0 . . . . . Switching
C — 4-4-0 . . . . . Passenger, old style
D — 4-4-0 . . . . . Passenger
E — 0-8-0 . . . . . Shifting
F — 4-6-0 . . . . . Freight
G — 0-10-0 . . . . . Switching
G — 4-6-2 . . . . . Fast passenger
H — 4-6-0 . . . . . Light freight
I — 2-8-0 . . . . . Heavy and local freight
J — 2-10-0 . . . . . Switching
K — 4-4-0 . . . . . Passenger
K — 2-10-2 . . . . . Heavy freight
L — 4-6-0 . . . . . Fast freight, later passenger
M — 2-4-2 . . . . . Fast passenger
M — 2-8-2 . . . . . Heavy freight
N — 2-6-0 . . . . . Passenger and freight
N — 2-8-8-2 . . . . . Pusher service
P — 4-4-2 . . . . . Fast passenger
Q — 2-6-4T . . . . . Suburban

NOTE: The letters C and H apply to locomotives of old design, with narrow fireboxes. After the old locomotives of Classes G, K, M, and N had disappeared from the roster, those letters were respectively applied to the new types 4-6-2, 2-10-2, 2-8-2 and 2-8-8-2, as they were subsequently introduced.

A Mountain Freight on the Catawissa Branch

The Mainville Bridge, shown in the illustration above, was one of eight spans on the Catawissa Railroad. In 1872 the line was leased to the Philadelphia and Reading Railroad Company and is now known as the Catawissa Branch. In 1929 the track was relocated near the former site of this bridge and filled with 405,253 cubic yards of material. Locomotive 249, on the bridge, was formerly the *Valentia*, as described on page 31.

America's first iron railroad bridge was located between West Manayunk, Philadelphia, and Flat Rock Tunnel on the Main Line. It was a 34-foot span, placed in service in May, 1845, and used until 1901.

Locomotive 225

This locomotive, formerly named the *Mississippi*, was acquired from the East Pennsylvania Railroad when that road was leased by the Philadelphia and Reading in May, 1869. Later the same year engine 225 was rebuilt by the Philadelphia and Reading as shown above.

The boiler feed pump behind the drivers was driven from a return crank on the rear driver, although the usual practice was to connect this pump with the crosshead. The flattening of the sides of the cylinders gave the engine more clearance.

This picture, taken in 1884, shows locomotive 225 on turntable at the Gordon, Pennsylvania, enginehouse. It was here the engines were serviced after helping heavy trains over the 2.2% grade which extends from Barry to Locust Summit on the Mahanoy and Shamokin Branch, now a part of the Shamokin Division. This roundhouse, built in 1869, is still in its original condition, although used for other purposes. It is located near the site of the Gordon Planes, which were abandoned in 1896.

No. 225 was one of 34 similar locomotives. In April, 1900, it was renumbered 1404, Class E-1-a and finally retired in March, 1905.

Locomotive 355

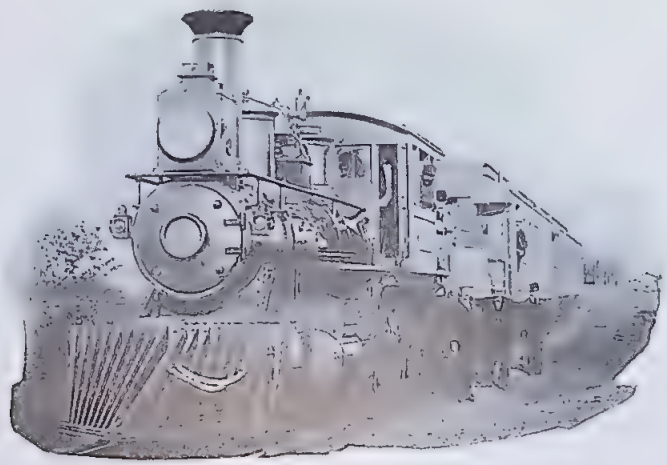
This locomotive, built at Reading in November, 1875, possessed similar characteristics to the *Hiawatha*. There were 30 engines in its class. The boiler was of the wagon-top type with two steam domes and sloping crown and roof sheets over the firebox. The firebox crown was stayed with radial bolts, no crown-bars being used. The arrangement on the *Hiawatha* of bolting the cylinder castings together on the center line of the locomotive, to form a flat bed for supporting the smokebox, was employed in the entire series. In the earlier locomotives there were two sandboxes, placed in the wheel covers; later, as on engine 355, an

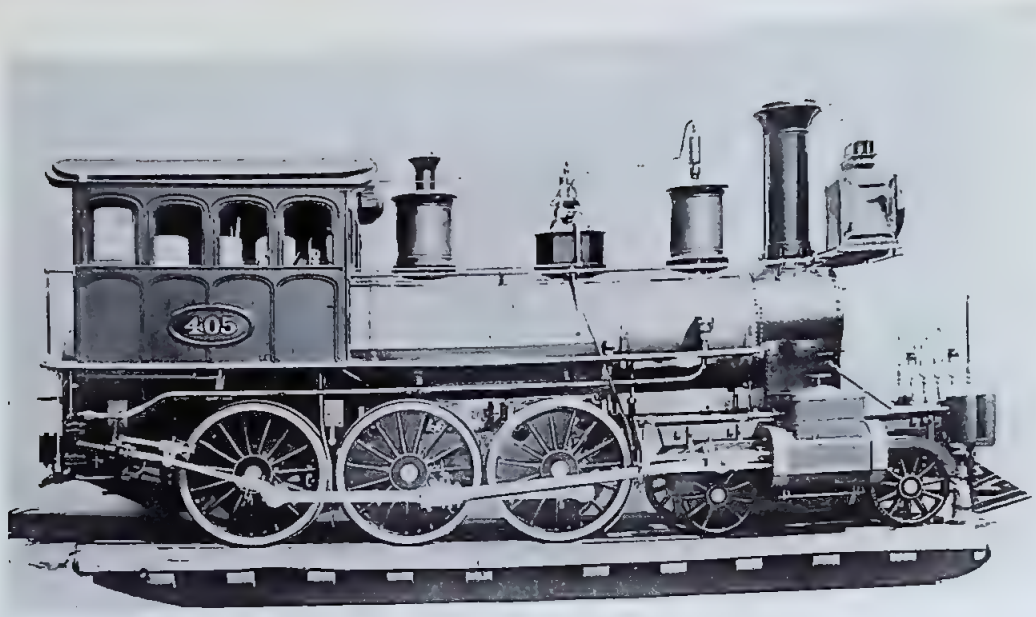
octagonal-shaped sandbox was placed over the boiler between the two domes and the bell was mounted on top of it.

Many of the earlier engines of this group were handsomely decorated with brass casings on the steam domes and cylinders and brass jacket bands around the boilers. The later locomotives, like the 355, had iron dome casings to match the boiler jackets, and the cylinder casings were of iron painted black. It was during the period of the seventies that many American roads began to dispense with the elaborate decorations formerly in vogue, and the Reading was among them.

Note the "lump" coal piled on the tender. The boiler extended entirely through the cab and the fireman stood on the tender deck when firing. With the cab placed high up on the running boards there was excellent "visibility" for the engine crew. The locomotive was later renumbered 138, Class C-6-a, and was scrapped in 1902.

The photograph below shows engine 315, one of the same group as the 355, on the Chester Branch in 1892 pulling the "Canary," a well known train of that period. This locomotive was built at the Reading Shops in May, 1876. Later it was renumbered 133, Class C-5-a. This class had drivers 61½" in diameter, while Class C-6-a had 68½" drivers. Locomotive 315 was scrapped in April, 1905.





Cylinders	18" x 24"
Drivers	54"
Boiler Pressure	120 lbs.
Grate Area	27.6 sq. ft.
Heating Surface	1137 sq. ft.
Weight on Drivers	63,000 lbs.
Total Weight	89,000 lbs.
Tractive Force	14,690 lbs.

THE APPRENTICE ENGINE

This locomotive was constructed in the Reading Shops by a group of 19 apprentices in 1876. Numbered 405 it was a ten-wheeled (4-6-0 type) locomotive, and represented the highest development of the "gunboat" series, the first of which was the *Nevada* shown on page 30. This locomotive was built for freight service, and was exhibited at the Centennial Exposition which opened at Philadelphia, May 10, 1876.

No. 405 was one of the last of her class built at Reading Shops. In April, 1900, it was renumbered 501, Class H-1-a and retired in October, 1912.

405 and Her Builders

NINTH and GREEN STREETS TERMINAL

This photograph, taken in 1890, shows the old 9th & Green Streets passenger station in Philadelphia which was originally built in 1851 by the Philadelphia, Germantown & Norristown Railroad. This station became the terminal for the Philadelphia & Reading Railroad when it leased the Philadelphia, Germantown & Norristown Railroad in 1870. The Ninth and Green Streets Terminal served as the Philadelphia & Reading central city station until 1893, when the present Reading Terminal was completed.

Locomotive 408

THE EARLY WOOTTEN LOCOMOTIVES

In 1877 John E. Wootten, General Manager of the Philadelphia & Reading Railroad, patented a boiler especially designed to burn waste anthracite or culm. Large quantities of this material had collected at the mines and Wootten realized that important economies could be effected by burning the waste in locomotives. To do this, it was necessary to carry a thin fire and a light draft in order to avoid blowing the fuel from the stack; this could be accomplished only by employing a much larger grate area than was then in use in locomotives burning lump anthracite. With this in mind, Wootten placed the firebox of the boiler entirely above the driving wheels so that the width was limited only by the loading gauge. A combustion chamber extended forward into the boiler barrel, and was separated from the firebox proper by a bridge wall. The grate consisted of water-tubes and cast iron bars, and the junction of the firebox and combustion chamber was so arranged that, even with the grate placed entirely above the driving wheels, it was not necessary to raise the boiler center to an excessive height above the rails.

The first Wootten boiler locomotive was engine 408, built at the Reading Shops in January, 1877. It was of the ten-

wheeled, 4-6-0 type, and apart from the boiler, was similar to the "gunboats" which preceded it. Another locomotive like No. 408 was No. 412. It was completed at Reading in January, 1878, and subsequently underwent extensive trials on the railways of France and Italy, burning low grade fuels with success.

These two locomotives, as first built, had the cab placed over the firebox, as shown in the photograph of engine 408 on this page. Before being tested on the European Railways, however, it was necessary to partially rebuild No. 412 by placing the cab ahead of the firebox in order to come within the height limit. Engine 408 is shown on page 44 as rebuilt in the same manner. It was followed by other types having Wootten boilers. These were the American (4-4-0) for passenger service, the Consolidation (2-8-0) for "drag" service, and the 0-6-0 and 0-8-0 types for switching service. Additional locomotives, similar to Nos. 408 and 412, with the cab over the boiler, were also built. These central cab locomotives were generally known on the Reading as "Camelbacks," and on certain other roads in the anthracite region as "Mother Hubbards."

JOHN E. WOOTTEN

The first ten-wheeled type locomotives were fitted with feed-water heaters, patented by Mr. Wootten. The heater was placed under the running board, and consisted of a long cylindrical drum, containing a group of tubes through which exhaust steam was passed. Water was forced into the drum by means of a pump, driven from a return crank pin. The engineman could regulate the amount of exhaust steam entering the heater to suit the conditions under which the locomotive might be working.

The Wootten locomotives on the Reading were very substantial fuel savers, for in 1883, according to the Annual Reports of the Company, 171 locomotives using waste anthracite reduced the fuel bill by $378,000.

The influence of the Wootten boiler was far reaching. In either its original or modified form, it was soon adopted by virtually all anthracite-burning railroads, and it exerted a marked influence on the subsequent development of high-power boilers designed for burning bituminous coal.

408 as built with cab over firebox

Locomotive 42

This photograph was taken at Philadelphia, Pennsylvania, on October 31, 1887. This 0-6-0 switch engine was built by the Philadelphia and Reading in June, 1878, and was one of 29 in the same class. In 1900 it was renumbered 1266, class B-2-a and retired June, 1909.

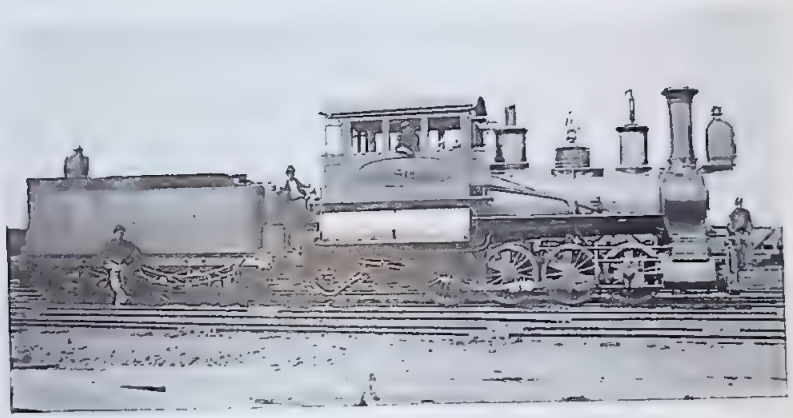
Cylinders	16″ x 18″	Heating Surface	788 sq. ft.
Drivers	43″	Total Weight	61,600 lbs.
Boiler Pressure	120 lbs.	Tractive Force	10,930 lbs.
Grate Area	49 sq. ft.		

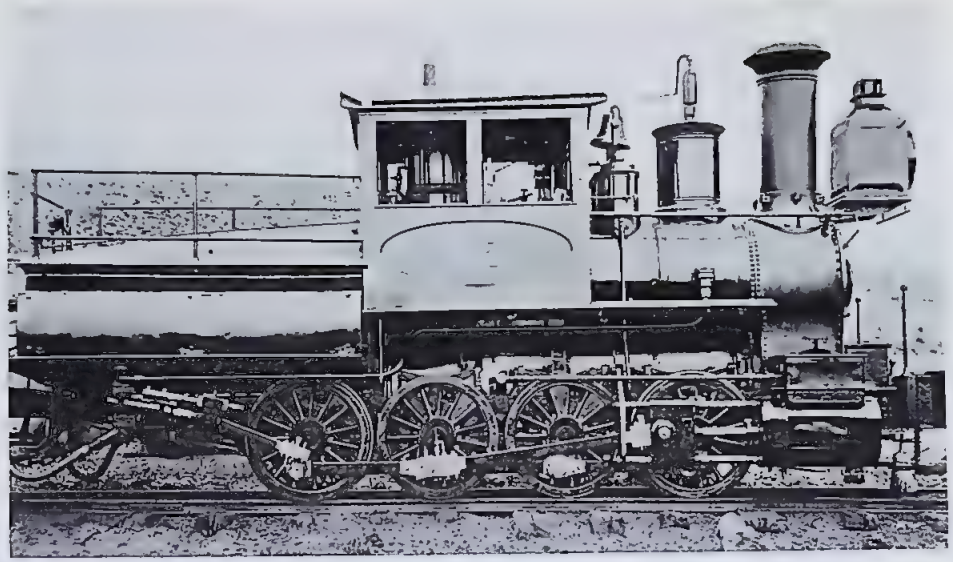
No. 50 was the first 0-8-0 type locomotive equipped with a Wootten firebox to burn waste anthracite. Built at the Reading Shops in March, 1878, it was later renumbered 1433 in 1900 and classified E-2-a.

There were four locomotives of this class and 17 similar ones, all of which were used in switching and transferring coal trains. As the Consolidation (2-8-0) type became more common, the 0-8-0 types were continued in switching service until retired. The photograph was taken at Elizabethport, New Jersey, September 1, 1885.

Cylinders	18″ x 22″	Heating Surface	965 sq. ft.
Drivers	43″	Total Weight	80,000 lbs.
Boiler Pressure	120 lbs.	Tractive Force	16,900 lbs.
Grate Area	63.7 sq. ft.		

Locomotive 50





Locomotive 65

This 0-8-0 switcher, built by the Philadelphia and Reading in May, 1879, was renumbered 1434 and classified E-2-a in April, 1900.

The earlier switching locomotives with Wootten boilers had the cab over the firebox, which arrangement was possible without exceeding the height limit. Later designs show the cab ahead of the firebox over the boiler barrel. This separated the engineer and the fireman for the latter, when shoveling coal, stood on the tender. This difference in cab positions is illustrated by Nos. 50 and 65. In August, 1902, engine 65 was sold for scrap.

Cylinders	18″ x 22″
Drivers	43″
Boiler Pressure	120 lbs.
Grate Area	63.7 sq. ft.
Heating Surface	965 sq. ft.
Total Weight	80,000 lbs.
Tractive Force	16,900 lbs.

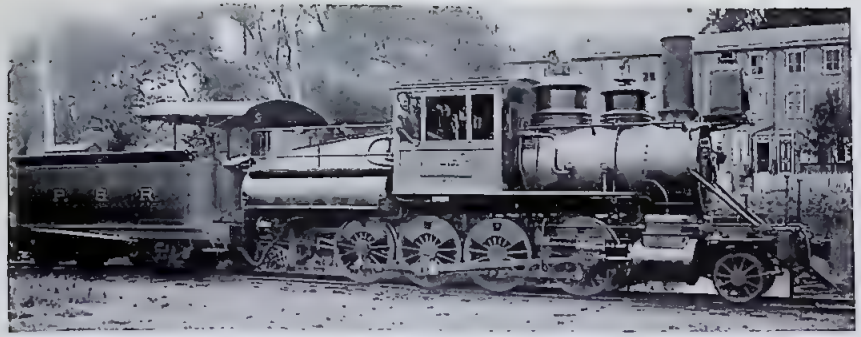
Locomotive 415

This anthracite coal-burning Consolidation locomotive was built by the Baldwin Locomotive Works in February, 1880, and first used on the Bethlehem and New York Branch freight trains. The 415, one in the first series of 2-8-0 locomotives operated on the Philadelphia and Reading, was a large locomotive for that day, and for many years performed good work in coal service.

This series of 28 locomotives had the Wootten feed-water heater applied, but an injector was used instead of a pump. The boiler was designed in accordance with Wootten's patent.

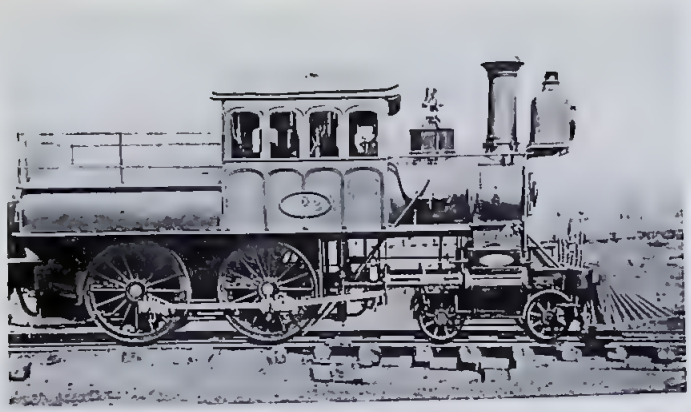
The 415 was renumbered 704 in April, 1900, Class I-1-a. In January, 1905, it was rebuilt and reclassified I-3-a and retired November, 1930.

Cylinders	20" x 24"
Drivers	50"
Boiler Pressure	120 lbs.
Grate Area	76 sq. ft.
Heating Surface	1375 sq. ft.
Weight on Drivers	98,300 lbs.
Total Weight	113,900 lbs.
Tractive Force	19,390 lbs.



Locomotive 127

This picture illustrates locomotive 127, Class I-1-b, a development of the Class I-1-a, which is shown on the opposite page. No. 127 was one of 30 similar engines built by the Baldwin Locomotive Works in 1881, and is illustrated as slightly modified with straight stack and the feed-water heater removed. The I-1-b differed mainly from the I-1-a in that the main rod connected on the third pair of drivers instead of the second pair as shown in the illustration of engine 415. Note the canopy attached to the tender for the protection of the fireman.



Locomotive 122

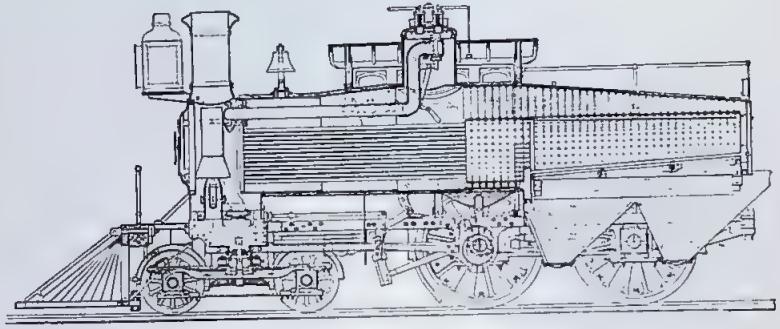
Engines 122 and 411 were early Wootten locomotives similar in detail to the narrow firebox locomotives which preceded them. For example, the frame construction and the method of supporting the smokebox on the cylinder castings were much alike, the chief difference being in the design of the boiler and the cab arrangement and fittings.

Locomotive 122 was the first passenger locomotive with wide firebox to burn waste anthracite or culm. It was built by the Reading in December, 1878, and was evidently rebuilt during the early 1880's into a standard pattern of the D33 class like 373 on page 53. The locomotive was sold for scrap in June, 1899.

No. 411, with a sister locomotive 506, was built at Reading in 1880. These were the heaviest passenger locomotives constructed in the United States at that time, weighing 43.8 tons each. Both

Dimensions of Engine 411

Cylinders	21" x 22"
Drivers	68½"
Boiler Pressure	135 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,360 sq. ft.
Weight on Drivers	68,000 lbs.
Total Weight	103,000 lbs.
Tractive Force	16,250 lbs.



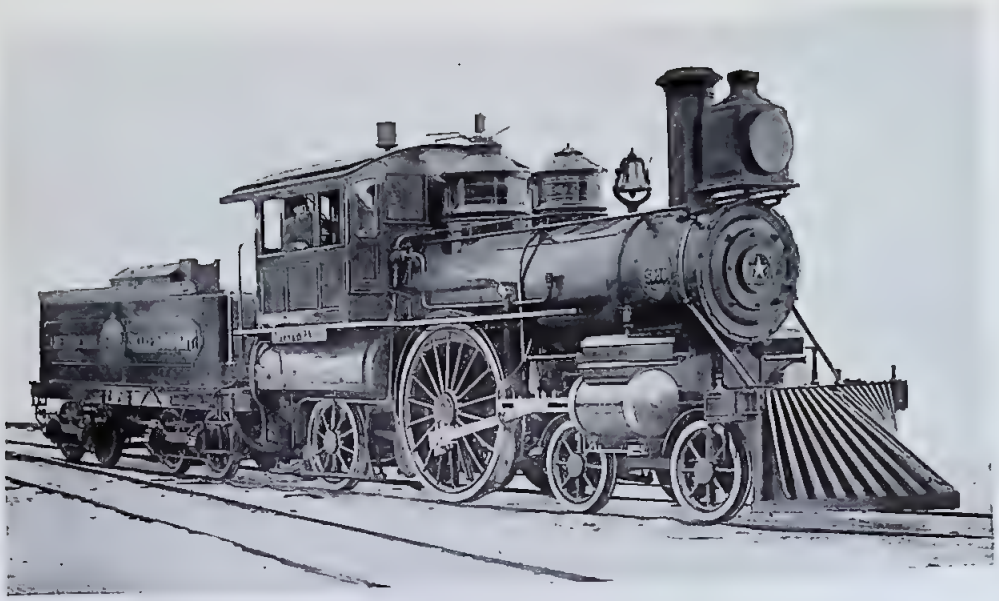
Sectional View of Locomotive 411

Locomotive 411

were placed in the New York service. The Reading leased the North Pennsylvania Railroad and the Delaware & Bound Brook in May, 1879, and by using these tracks and the facilities of the Central Railroad of New Jersey east of Bound Brook, through trains were run between Philadelphia and Jersey City in two hours.

Each locomotive made two round trips, aggregating 240 miles per day. The fastest schedule, including one stop and three slowdowns, allowed 64 minutes for 54.9 miles between Wayne Junction and Bound Brook, and it was necessary to maintain a speed of 72 miles an hour for eight miles. On one occasion, a train of 15 cars was hauled from Wayne Junction to Bound Brook, 54.9 miles, in 76 minutes, a remarkable performance at the time. On these runs, lump anthracite was burned in place of culm in order to safeguard against steam failures, and a three-man engine crew was employed to "facilitate rapid firing," according to Mr. Wootten. The third man was known as the "furnace door opener."

The design of 411 was followed by a large number of similar locomotives constructed at the Reading Shops and Baldwin Locomotive Works. No. 411 was renumbered 206, Class D-5-e in April, 1900, and retired March, 1907.

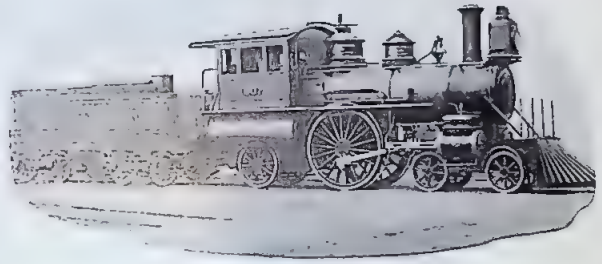


Lovett Eames Locomotive

Originally numbered 507, this engine shown above was the 5000th locomotive built by Baldwin Locomotive Works. Completed in 1880 as a 4-2-2 type locomotive it was fitted with a traction-increasing device. By means of a pair of steam cylinders, the fulcrums of the equalizing beams between the driving and trailing wheels could be shifted, thus throwing more weight on the drivers to increase the adhesion when starting. The locomotive had a large firebox—but not a regular Wootten—placed back of the drivers and over the trailing wheels. Lump anthracite was burned. During a test run engine 507 hauled a four-car train from Philadelphia to Jersey City, 89 miles, in 98 minutes.

Due to the Reading's financial difficulties, engine 507 was taken back by the builders and later sold to Lovett Eames, inventor of a vacuum brake bearing his name. Mr. Eames fitted and decorated the engine as shown in the accompanying photograph and transported it to England in 1881 to demonstrate his invention. Three years later the engine was sold for scrap but the bell was preserved and is now in the American Embassy in London.

Cylinders	18" x 24"
Drivers	78"
Boiler Pressure	140 lbs.
Grate Area	56 sq. ft.
Heating Surface	1,384 sq. ft.
Weight on Drivers	35,000 to 45,000 lbs.
Total Weight	85,000 lbs.
Tractive Force	11,900 lbs.



Locomotive 373 and Train at Jenkintown, Pa.

This photograph shows a six-car express train at Jenkintown, Pennsylvania, about 1882. The cars were typical of the period, and it is interesting to note that those with the oval plaque on the side were North Pennsylvania Railroad coaches. These came on the Philadelphia and Reading in May, 1879, when the "North Penn" became a part of the present Reading System.

No. 373 was built in September, 1882, at the Reading Shops, and later renumbered 196, Class D-4-c.

In June, 1897, the locomotive was reboilered, classified D-3-e in April, 1900, and finally retired in May, 1923.

Locomotive 97

Built in the Reading Shops in June, 1885, this engine was the second of the new D-44 class. It was placed in fast passenger service between Philadelphia and Jersey City. Renumbered in 1900 to 209, class D-5-a, it was finally retired in August, 1911.

The cylinders of locomotive 97 were 21″ x 22″ and the drivers were 68″ in diameter. The boiler was an improved Wootten type with the crown and roof sheets of the firebox horizontal instead of sloping.

This photograph was taken in the New York, Lake Erie and Western yard at Jersey City on November 3, 1885, when the locomotive was loaned to the Erie for experimental purposes in connection with the Wootten type boiler.

Locomotive 206

Locomotive 206, together with four others of the same class, was built at the Reading Shops in 1886. The 206 may justly be regarded as one of the Reading's most notable locomotives due to the fact that on August 27, 1891, it established a world's record for speed while hauling a special train of three cars on the New York Branch. The train was run by A. A. McLeod, then President of the Reading, to satisfy an "incredulous friend" who doubted the possibility of running a locomotive faster than 75 miles an hour. Near Neshaminy Falls the 206 ran a mile in 39⅘ seconds, equivalent to 90.5 miles an hour, and five consecutive miles were covered at an average of 87.0 miles an hour.

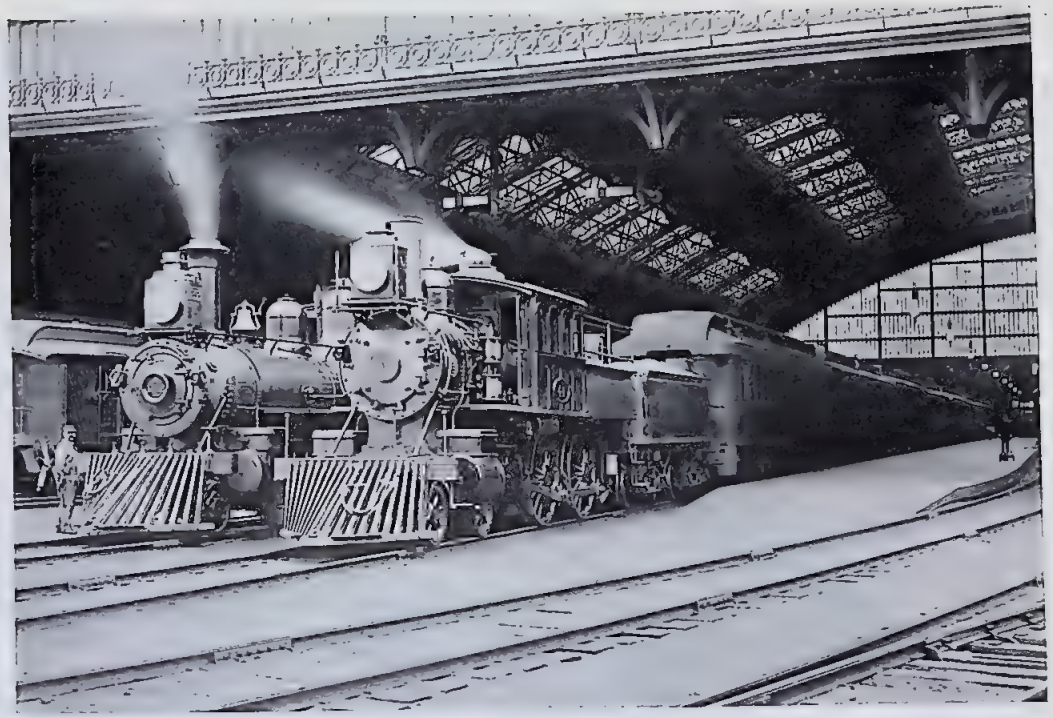
The boiler of engine 206 had a straight barrel and a horizontal roof sheet over the firebox, and represented a marked improvement in design as compared to the earlier Wootten boilers. The locomotive was renumbered 202 in April, 1900, Class D-4-f and was finally scrapped in 1921.

Cylinders	18½" x 22"
Drivers	68½"
Boiler Pressure	160 lbs.
Grate Area	68 sq. ft.
Heating Surface	1,348 sq. ft.
Weight on Drivers	68,700 lbs.
Total Weight	104,500 lbs.
Tractive Force	14,950 lbs.

Reading Terminal in the '90's

No. 1202 was originally No. 3 of the Pennsylvania, Poughkeepsie and Boston Railroad, leased by the Philadelphia and Reading in March, 1895. The engine was built by the Rogers Locomotive and Machine Works, Paterson, N. J., in May, 1889. It was given the Philadelphia and Reading number 232, unclassified, in April, 1900, and scrapped in 1907.

The Baldwin Locomotive Works built No. 44 in June, 1883. It was renumbered 149, class D-1-e, in April, 1900, and rebuilt in August, 1901, Class D-3-i. The locomotive was scrapped in January, 1921.

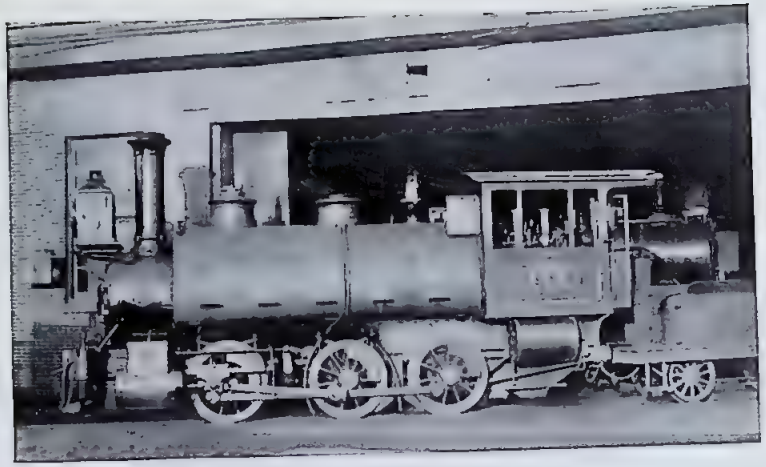


Locomotive 1202

Cylinders ....18" x 24"	Weight on Drivers, 52,000 lbs.
Drivers .....62"	
Boiler Pressure. 140 lbs.	Total Weight, 80,000 lbs.
Grate Area ...27 sq. ft.	
Heating Surface, 1,219 sq. ft.	Tractive Force, 14,900 lbs.

Locomotive 44

Cylinders ..18½" x 22"	Weight on Drivers, 65,800 lbs.
Drivers .....61½"	
Boiler Pressure. 130 lbs.	Total Weight, 99,500 lbs.
Grate Area....68 sq. ft.	
Heating Surface, 1,028 sq. ft.	Tractive Force, 13,500 lbs.



Locomotive 445

Built at the Philadelphia and Reading Shops at Reading, Pennsylvania, in November, 1886, the tender of this 0-6-0 switch engine carried only coal, as there was a saddle tank for 1000 gallons of water.

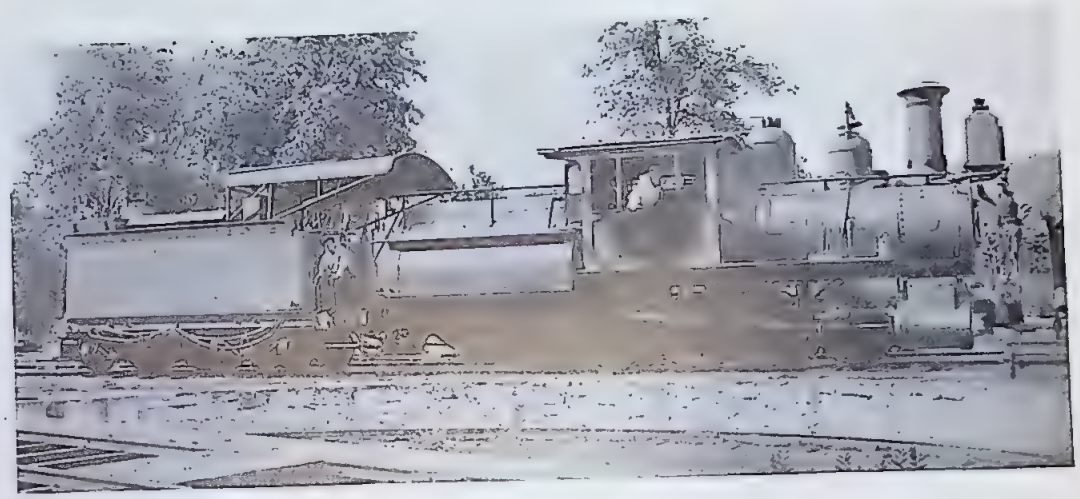
Later renumbered 1294 in 1900, class B-3-a, the locomotive was retired in November, 1921. Of the four other locomotives in the same class, No. 1293 used as a "roundhouse goat" at Ninth and Green Streets, was the last to be scrapped in 1930.

Cylinders ..... 16" x 22"	Heating Surface ..... 911 sq. ft.
Drivers ..... 44"	Total Weight ..... 81,300 lbs.
Boiler Pressure ..... 130 lbs.	Tractive Force ..... 14,150 lbs.
Grate Area ..... 35.4 sq. ft.	

Locomotive 93

This photograph was taken at West Falls, in November, 1885, the same month the 93 was built at Reading Shops. There were only two engines in this class. Locomotive 93 was renumbered 1449, class G-2-a, and retired in May, 1912.

Cylinders	20" x 26"
Drivers	42¾"
Boiler Pressure	135 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,354 sq. ft.
Total Weight	107,000 lbs.
Tractive Force	27,915 lbs.



Locomotive 965

Ordered from the Baldwin Locomotive Works in September, 1887, this 4-4-0, class K-1-c locomotive was first run on the Reading in September, 1888. It was one of thirteen passenger engines of the same class. Originally it was equipped with a wagon top boiler as shown, but later a straight boiler was applied. It was designed to burn lump anthracite on a long, narrow grate. However, the Wootten boiler locomotives with their wide fireboxes and increased grate area, were better steamers and could burn a cheaper fuel. No. 965 was rebuilt with a Wootten boiler in January, 1899, later renumbered 241, class D-8-a, and retired December, 1933.

Cylinders....19½" x 24"	Weight on Drivers, 77,000 lbs.
Drivers .....67½"	
Boiler Pressure ..160 lbs.	Total Weight..113,000 lbs.
Grate Area....38.3 sq. ft.	Tractive Force..18,400 lbs.
Heating Surface. 1,514 sq. ft.	

Locomotive 955

There were six freight engines of the class illustrated below built by the Baldwin Locomotive Works, with long fireboxes over the frames. They were designed to burn lump anthracite as their grate areas were too small to burn buckwheat.

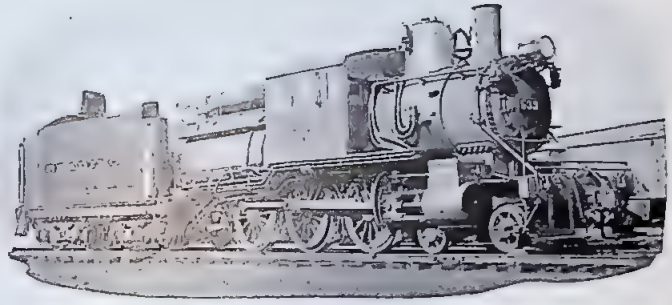
Locomotive 955 was built in July, 1888, and in February, 1892, was rebuilt with a Wootten boiler. In April, 1900, it was renumbered 945, class I-5-a, and scrapped in February, 1937.

Cylinders .....22" x 28"	Heating Surface ....2,345 sq. ft.
Drivers .....50"	Weight on Drivers..135,000 lbs.
Boiler Pressure .....140 lbs.	Total Weight .....150,000 lbs.
Grate Area .....38.7 sq. ft.	Tractive Force .....32,200 lbs.

Cylinders	20" x 24"
Drivers	68½"
Boiler Pressure	145 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,682 sq. ft.
Weight on Drivers	93,000 lbs.
Total Weight	121,000 lbs.
Tractive Force	19,240 lbs.

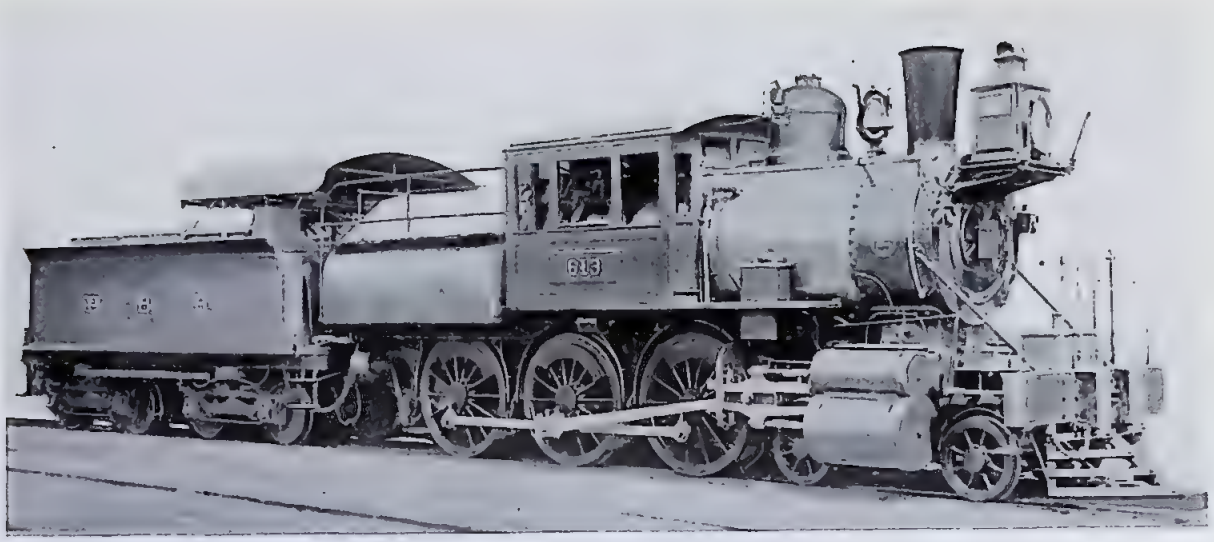
Locomotive 568

This 4-6-0 locomotive was one of 15 built by the Baldwin Locomotive Works in March and April, 1890. These were the first locomotives especially designed for fast freight service on the Philadelphia and Reading. No. 568 was renumbered 545 in April, 1900, and retired in August, 1927.



Locomotive 539

Locomotive 539 is at present the oldest locomotive on the Reading roster which has not undergone an extensive rebuilding. It was originally No. 561, built in March, 1890, and was like No. 568 shown above. This engine was renumbered 539 in April, 1900, class L-1-a, and celebrated its 51st year of service on the Reading in March, 1941.



Locomotive 613

Differing from engine 568 on the opposite page, in that it originally had compound cylinders 13½″ and 23″ x 24″, locomotive 613 had dimensions exactly the same as 568 in other respects. The steam pressure was increased to 175 lbs. and the tractive force of 17,680 lbs. (working compound) could be increased, at starting, by admitting steam through the starting valve, direct from the boiler to the low pressure cylinders.

Locomotive 613 was the 12,401st engine built by the Baldwin Locomotive Works. At the present time it is in service at Rutherford, Pennsylvania, on a work train.

It was completed in January, 1892, and renumbered 551, Class L-2-a, in April, 1900. In June, 1904, the cylinders were changed to single expansion and the locomotive was then reclassified L-1-c.

No. 573

Cylinders	21″ x 22″
Drivers	68½″
Boiler Pressure	160 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,320 sq. ft.
Weight on Drivers	73,000 lbs.
Total Weight	107,000 lbs.
Tractive Force	19,200 lbs.

Locomotive 573

The D-44 class, of which No. 573 is a Baldwin-built example, represented a distinct advance in the Reading's passenger locomotives. The first were built in the Reading Shops in October, 1884, and subsequently orders were placed with Baldwin for locomotives of the same general design, viz.: Nos. 1015-1020 (Atlantic City R. R.), May and June, 1889; Nos. 569-578, June, 1890; Nos. 594-597, July, 1890.

These locomotives had a well developed arrangement of Stephenson link motion, and were equipped with a steam reversing gear. The valves had inside exhaust clearance and long outside lap and travel. The *Railroad Gazette* reported that tests had shown these locomotives developed 1200 horsepower at 70.9 miles an hour—an unusually high figure in proportion to the weight of the locomotive.

No. 573 was one of ten built by Baldwin in June, 1890, which were designed by L. B. Paxson, Superintendent of Motive Power. In April, 1900, the locomotive became 216, class D-5-c, and was retired in January, 1913.

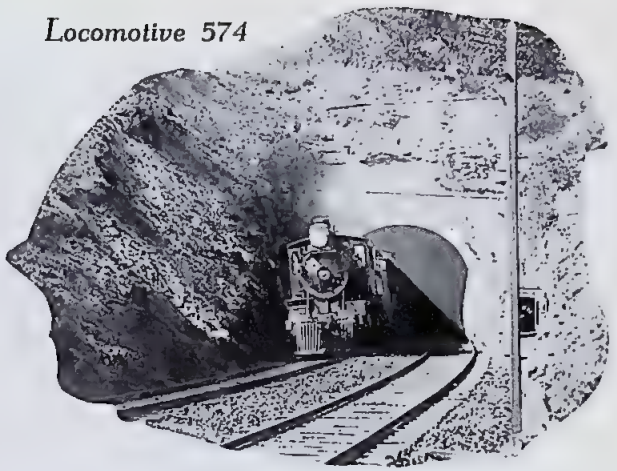
This class did excellent work on the Bound Brook Route, the Bethlehem Branch, and the Atlantic City Railroad. In the *Springtown Weekly Times*, dated December 18, 1897, an account states,

"A rather extraordinary run was made . . . by train 322, engine 569, from Bethlehem to Philadelphia. . . . The run of 57 miles was made in 70 minutes, including three stops and three slowdowns. From Bethlehem to Quakertown . . . 17½ miles was made in 18 minutes. From Souderton to Lansdale 5½ miles was made in 4½ minutes. The 33 miles from Bethlehem to Lansdale were made in 33 minutes, and 24 miles from Lansdale to Philadelphia was made in 37 minutes. The train left Bethlehem late . . . which accounted for the speed."

The last locomotive of this class, No. 215, originally 572, was retired May, 1933.

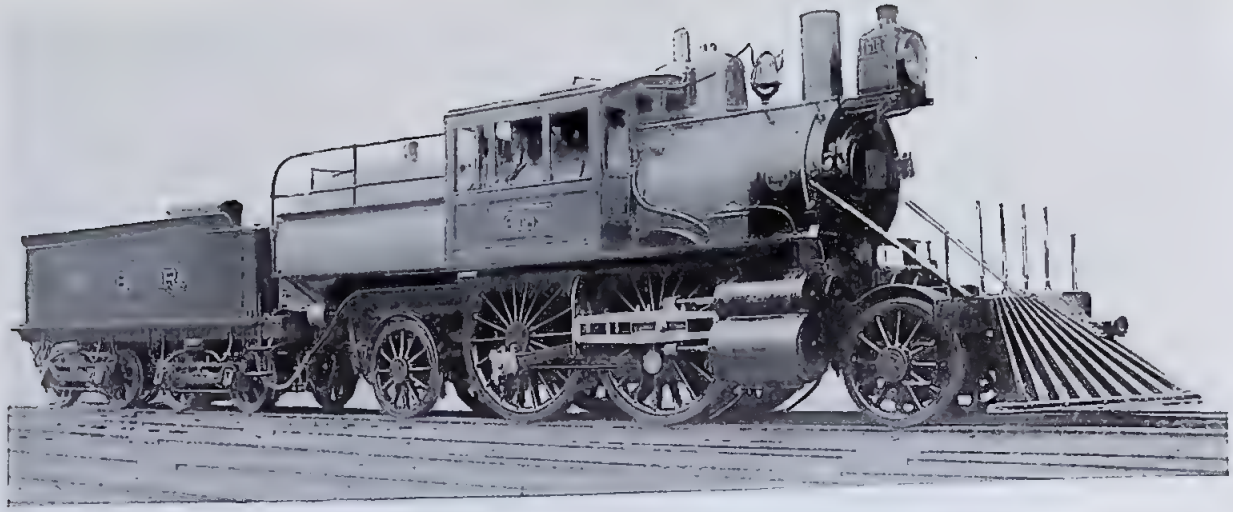
Locomotive 569

Locomotive 574



Here No. 569 is shown at Bound Brook, coupling to a New York Express train bound for Philadelphia. Note the vestibuled passenger coach which was built by the Pullman Company.

No. 574 is emerging from Perkasie Tunnel southbound on the Bethlehem Branch. Observe the engineer in the cab, and the white tinge about the top of smokestack, caused by the use of hard coal for fuel. The tunnel, 2150 feet long, a notable engineering feat, was built by the old North Pennsylvania Railroad and the stone arching, constructed when the tunnel was enlarged by the North Pennsylvania Railroad, remains unchanged to this day.



Locomotive 618

Cylinders, 13″ and 22″ x 24″	Heating Surface, 1,435 sq. ft.
Drivers .....78″	Weight on Drivers, 82,700 lbs.
Boiler Pressure....180 lbs.	Total Weight ..129,700 lbs.
Grate Area .....76 sq. ft.	Tractive Force. 12,940 lbs.*

**Working Compound.*

The first Columbia or 2-4-2 type on the Philadelphia and Reading was No. 618, built by the Baldwin Locomotive Works in January, 1892. In fast passenger service between Philadelphia and New York, it was one of eleven Columbia types on the Reading. Another engine of this same class, No. 694, was exhibited by the Baldwin Locomotive Works at the Columbian Exhibition at Chicago in 1893.

These engines were inclined to be "slippery" and the large leading truck wheels were considered dangerous at high speed, and for these reasons the Atlantic type soon replaced them.

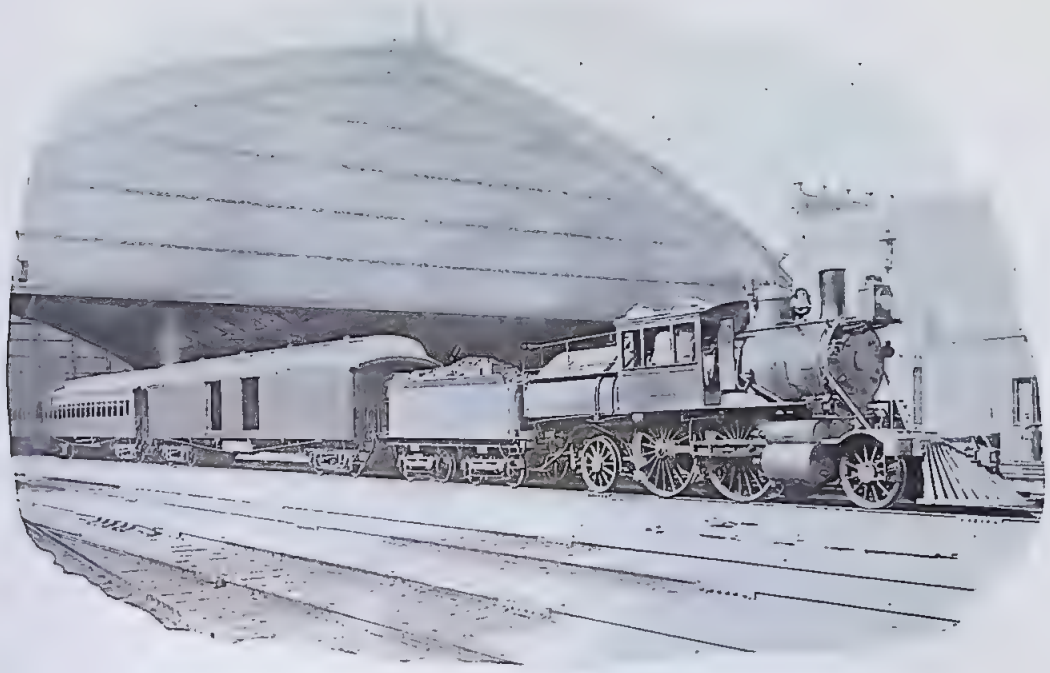
The 11 Columbia type locomotives were rebuilt. Ten were changed to

the 2-6-0 type, class N-4-a, and were run with that wheel arrangement until scrapped. However, four were again rebuilt into the 4-6-0 type. All but one original Columbia type locomotive, rebuilt in any form, was retired before 1912.

In 1900 locomotive 618 was renumbered 301, class P-2-a (4-4-2), and was retired in December, 1906.

Locomotive 302 is shown below leaving Reading Terminal at the beginning of an express run to New York. Note the open platform on the baggage car and the typical coaches as used on Reading express trains at the turn of the century.

The dimensions of No. 302 were the same as those of No. 618 given on page 64. Locomotive 302 was originally numbered 619 when it was built by the Baldwin Locomotive Works in May, 1892. When renumbered in April, 1900, No. 302 was classified M-1-a. In 1904 the engine was rebuilt to a 2-6-0 class N-4-a, again renumbered 303 in August, 1908, and scrapped in June, 1909.



Locomotive 378

The Railroad Gazette, dated August 9, 1895, stated that a Reading locomotive of the "Flying Dutchman" type had been run for nearly a year with the parallel rods removed. With this arrangement, the locomotive was practically a "single driver." The success of the experiment led to the building of engines 385 in 1895 and 378 in 1896. These locomotives, which were of the 4-2-2 type, were reported to have handled as many as eight cars. An inferior pea coal, costing 65 cents a ton, was used for fuel.

The *Gazette* article also states that the locomotives were designed by William P. Henzey of the Baldwin firm, co-operating with L. B. Paxson, Superintendent of Motive Power of the Philadelphia and Reading. The locomotives were quite "slippery" and even under the most favorable conditions the northbound grade (1.8%) at Fern Rock, Pennsylvania, was a real test with a five or six car train.

Engine 378 was similar to 385, except for the boiler being slightly larger. The subsequent rebuildings and renumberings of these locomotives are as follows:

No. 385 built by Baldwin, July, 1895, and renumbered 316, April, 1900. No. 316 rebuilt by P&R, May, 1904, 4-4-0, class D-10-b. Renumbered 251, May, 1911. Retired July, 1933.

No. 378 built by Baldwin, February, 1896. Renumbered 317, April, 1900. Rebuilt by P&R, March, 1904, 4-4-0, class D-10-a. Renumbered 252, May, 1911. Retired May, 1930.

No. 251 and No. 252 for some time had 84" drivers, a remarkable size for a 4-4-0 with a Wootten firebox.

Cylinders	13" and 22" x 26"	Heating Surface	1,460 sq. ft.
Drivers	84¼"	Weight on Drivers	48,000 lbs.
Boiler Pressure	200 lbs.	Total Weight	115,000 lbs.
Grate Area	76 sq. ft.	Tractive Force	14,400 lbs.*

* *Working Compound.*

Locomotive 547

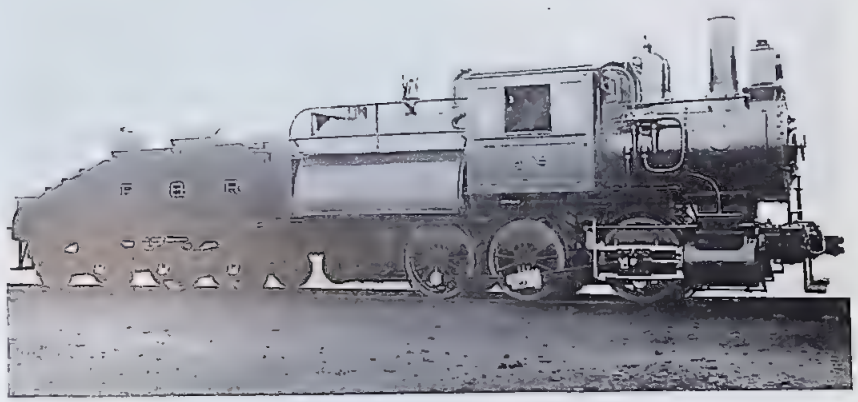
Between the years 1889 and 1896, 18 locomotives of this class were built by Baldwin Locomotive Works. Locomotive 547 was completed in January 1890 and was later renumbered 1218 and classified A-2-a. It is interesting to note that the water supply on this engine was carried in the saddle tank while the small four-wheeled tender carried coal only. The Camden Forge Company finally bought the locomotive in May 1917.

Cylinders	14″ x 22″	Heating Surface	680 sq. ft.
Drivers	44″	Total Weight	54,700 lbs.
Boiler Pressure	145 lbs.	Tractive Force	12,100 lbs.
Grate Area	28.3 sq. ft.		

Locomotive 475

This is an excellent example of a 0-6-0 locomotive built for general switching service as designed for burning buckwheat coal. It was built by Baldwin in April 1899, renumbered 1306, class B-5-b in 1900 and remains in service.

Cylinders	20″ x 24″	Heating Surface	1,298 sq. ft.
Drivers	50″	Total Weight	121,000 lbs.
Boiler Pressure	160 lbs.	Tractive Force	26,110 lbs.
Grate Area	75.9 sq. ft.		



Locomotive 1027

Two Atlantic 4-4-2 type locomotives, 1026 and 1027, were built by the Baldwin Locomotive Works in March, 1896. They were designed to cover the 55½ miles between Camden and Atlantic City in 60 minutes with eight cars and in 50 minutes with six cars. The horsepower necessary for such work was estimated at 1400 and under test the locomotives developed 1450 horsepower at 70 miles per hour. During the months of July and August, 1897, the average running time, with engine 1027, was 48 minutes, equivalent to a start-to-stop speed of 69.3 miles per hour. The fastest run was made in 46½ minutes at an average speed of 71.6 miles per hour. The chart showing the record of No. 1027 for these two months is shown on page 69.

Locomotive 1027 had the honor of hauling the fastest train in the world at that time.

It was the first Atlantic type on any part of the Reading System. It was fitted with a Wootten boiler and Vauclain compound cylinders. Later renumbered 25, in April, 1900, it was then classified P-1-a. In April, 1904, it was reclassified P-1-d when changed to a single expansion engine, and finally retired in April, 1927.

Cylinders	13″ and 22″ x 26″	Heating Surface	1,835 sq. ft.
Drivers	84¼″	Weight on Drivers	78,600 lbs.
Boiler Pressure	200 lbs.	Total Weight	142,900 lbs.
Grate Area	76 sq. ft.	Tractive Force	14,400 lbs.*

* *Working Compound.*

LOCOMOTIVE 1027 JULY

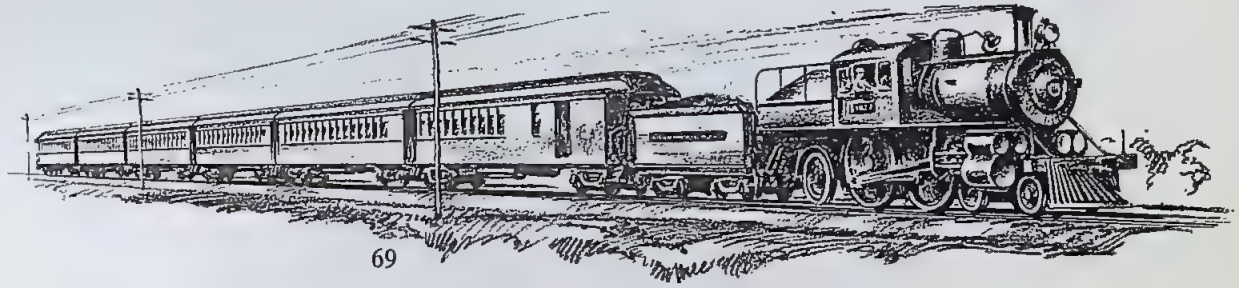
Stations	Distance	Schd. Time	2d	3d	5th	6th	7th	8th	9th	10th	12th	13th	14th	15th	16th	17th	19th	20th	21st	22d	23d	24th	26th	27th	28th	29th	30th	31st
Camden	.0	3.48	3.50½	3.50½	3.50½	3.50½	3.51	3.50½	3.49½	3.49½	3 49½	3.49	3.49½	3.50½	3.51½	3.51½	3.51	3.51	3.50½	3.50	3.49½	3.49	3.49	3.49½	3.48½	3.49	3.49	3.50
West Collingswood	3.1	3.54	3.55	3.55	3.55	3.55	3.56	3.55	3.54½	3.54	3.54	3.54	3.54	3 54½	3.56	3.55½	3.55	3.55½	3.56	3.55	3.54½	3.54	3.54	3.54	3.53½	3.53½	3.54	3.55
Haddon Heights	5.5	3.56	3.57½	3.58	3.57	3.58	3.58	3 57½	3.57	3 57	3·56½	3.56½	3 56	3.57½	3.59	3.58½	3.58	3.58	3.58	3.57	3.56½	3.57	3.56½	3.56½	3.56	3.56	3.57	3.57½
Magnolia	7.9	3.58	4.00	4.00	4.00	4.00	4.00½	3.59½	3.59½	3.58½	3.59	3.58½	3 59	3.59½	4.01	4.01	4.00	4.00	4.00½	3.59½	3.59	3.59	3.59	3.59	3.58	3.58½	3.59	3.59½
Clementon	12.0	4.02	4.03	4.03½	4.03½	4.03	4.04	4.02½	4.02½	4.02	4.02	4.01½	4 02	4 02½	4.04	4.04	4.03	4.03	4.03½	4.02	4.02	4.02	4.02	4.02	4.01	4.01½	4.02	4.03
Williamstown J'ct	17.0	4.06	4.07½	4.08	4.07½	4.07	4.08	4 07½	4.06½	4.06	4.06	4.06	4 06	4 06½	4.08	4.08½	4.07	4.07½	4.07½	4.06	4.07	4.06	4.06	4.06	4.06	4.06	4.06	4.07
Cedar Brook	19.9	4.09	4.10	4.10½	4.10½	4.10	4.10½	4.09½	4.09½	4.09	4.09	4.08½	4.08½	4 09½	4.10½	4.11	4.09½	4.09½	4.10½	4.09	4.09	4.09	4.09	4.09	4.08	4.08½	4.09	4.09½
Winslow Junc	24.5	4.12	4.13½	4.14	4.14	4.13½	4.14	4.13	4.13	4.12½	4.13	4.12½	4 12	4 13	4.14	4.15	4.13	4.13	4.14	4.12½	4.12½	4.12½	4.12½	4.12½	4.11½	4.12	4.12½	4.12½
Hammonton	27.6	4.15	4.16	4.16½	4.16½	4.16	4.16½	4.15½	4.15	4.15	4.15	4.14½	4.14½	4 15	4.17	4.17½	4.15½	4.16	4.16½	4.15	4.15	4.15	4.15	4.15½	4.14	4.14½	4.15	4.15
Elwood	33.8	4.20	4.20½	4.21	4.21	4.20½	4.21½	4.20½	4.20½	4.20	4.20	4.19½	4.19½	4 20	4.21	4.22	4.20	4.20½	4.21	4.19½	4.20	4.19½	4 20	4.20	4.19	4.19	4.19½	4.20
Egg Harbor	38.7	4.24	4.25	4.25	4.25	4.24	4.25	4.24½	4.24	4.24	4.24	4.24	4.23½	4.23½	4.24½	4.26	4.24	4.24	4.25	4.23½	4.24	4.24	4.24	4.24	4.23	4.23	4.23	4.23½
Brigantine Junc	43.5	4.28	4.28½	4.29½	4.29	4.28	4.29	4.28	4.28	4.28	4.28	4.27	4.27	4.27	4.28½	4.29½	4.27½	4.28	4.29	4.27	4.27½	4.27	4.27½	4.28	4.27	4.26½	4.26½	4.27½
Pleasantville	50.5	4.33	4.34½	4.35	4.34	4.34	4 35	4.33	4.33	4.33	4.33½	4.33	4.32	4.33	4.34	4.35½	4.32½	4.33½	4.34½	4.32½	4.33	4.32½	4.33	4.33½	4.32½	4.32½	4.32	4.33
Meadow Tower	53.8	.....	4.37	4.37	4.37	4.36½	4.37	4.35½	4.36	4.36	4.36	4.35½	4.34½	4.35	4.36½	4.37½	4.35½	4.36	4 37	4 35½	4.36	4.35	4.36	4.36	4.35½	4.35	4.35	4.35½
Atlantic City	55.5	4.40	4.38½	4 38½	4.38	4.37½	4.38½	4.37½	4.37½	4.37½	4.37½	4.37	4.36	4.39	4.38½	4.39½	4.38	4.38	4 38½	4.37½	4.38	4.38	4.39	4.38½	4.38	4.38	4.37	4.38
Number of Cars	.....	.....	5	5	5	6	5	5	6	6	5	5	5	5	5	6	5	5	5	5	6	6	5	5	5	6	6	6
Passengers carried	.....	.....	196	260	34	138	128	154	206	307	150	116	25	171	184	314	150	146	192	195	253	376	157	127	123	161	204	386
Running Time	.....	.....	48	47¾	47½	47	47½	47	48	48	48½	48	46½	48¾	47	48	47	47	47¾	47½	48½	49	50	49	49½	49	48	47
Miles per hr. (av'e)	.....	.....	69.3	69.7	70.1	70.8	70.1	70.8	69.3	69.3	69.0	69.3	71.6	68.3	70.8	69.3	70.8	70.8	69.7	70.1	68.6	67.9	66.6	67.9	67.6	67.9	69.3	70.8

AUGUST

Stations	Distance	Schd. Time	2d	3d	4th	5th	6th	7th	9th	10th	11th	12th	13th	14th	16th	17th	18th	19th	20th	21st	23d	24th	25th	26th	27th	28th	30th	31st
Camden	.0	3.48	3.51½	3.51½	3.51½	3.50½	3.50½	3.49½	3.50½	3.50½	3 49½	3.50	3.50½	3.51½	3.51½	3.51½	3.51½	3.51½	3.51	3.51½	3.49½	3.49½	3.49½	3.49½	3.49½	3.49½	3.50½	3.51
West Collingswood	3.1	3.54	3.56	3.56½	3.56	3.55½	3.55	3.54	3.55	3.55½	3.54½	3.55	3.55	3.56	3.56	3.56	3.56	3.55½	3.56	3.57	3.54	3.54	3.54	3.54	3.55	3.54	3.55	3.55
Haddon Heights	5.5	3.56	3.59	3.59	3.59	3.58½	3.57½	3.56½	3.57½	3.58	3 57	3.57	3.57½	3.58½	3.59	3.58½	3.58	3.58	3.58½	3.59	3.56½	3.57	3.56½	3.56½	3.56½	3.57	3.57½	3.58
Magnolia	7.9	3.58	4.01	4.01	4.01	4.00½	3.59½	3.59	3.59½	4.00½	3.59½	3.59½	3.59½	4.01	4.01	4.01	4.00½	4.00½	4.00½	4.01½	3.59	3.59	3.59	3.59	4.00	3.59	3.59½	4.00
Clementon	12.0	4.02	4.04	4.04½	4.04	4.03½	4.03	4.02	4.02½	4.03½	4.02½	4.02½	4.03	4.04	4.04½	4.04	4.03½	4.04	4.04	4.04½	4.02½	4.02	4.02	4.02	4.03	4.02	4.02½	4.03
Williamstown J'ct	17.0	4.06	4.08½	4.08½	4.08½	4.07½	4.07½	4.06	4.07	4.08	4.07	4.06½	4.07	4.08	4 08½	4 08	4.08	4.08	4.08	4.09	4.06½	4.06	4.06	4.06	4.07	4.06	4.06½	4.07
Cedar Brook	19.9	4.09	4.11	4.11	4.11	4.10½	4.09½	4.09	4.09½	4.10½	4.09	4.09	4.09½	4.11	4.11	4.10½	4.10½	4.10½	4.10½	4.12	4.09	4.09	4.08½	4.09	4.09½	4.09	4.09	4.10
Winslow Junc	24.5	4.12	4.14½	4.15	4.14½	4.13½	4.13	4.12½	4.12½	4.14	4.12½	4.12½	4.13½	4.14½	4.14½	4.14	4.13½	4.14	4.13½	4.15	4.13	4.12½	4.12½	4.12½	4.13	4.12	4.12½	4.13½
Hammonton	27.6	4.15	4.17	4.17	4.17	4.16	4.15	4.15	4.15	4.16½	4.15	4.15	4.15½	4.17	4.17	4.16½	4.16½	4.16½	4.16	4.17½	4.15	4.13	4.14½	4 14½	4.14½	4.15½	4.14½	4.15
Elwood	33.8	4.20	4.21½	4.21½	4.21½	4.20½	4.20	4.20	4.20	4.21½	4.19½	4.20	4.20	4.21½	4.21½	4.20½	4.20½	4.21	4.20½	4.22½	4.19½	4.19½	4.19	4.19½	4.20	4.19	4.19½	4.20
Egg Harbor	38.7	4.24	4.25	4.25	4.25	4.24	4.24	4.24	4.23½	4.24½	4 23	4.24	4.23½	4 25	4.25½	4.24½	4.24½	4.25	4.24	4.26	4.23½	4.23	4.23	4.23	4.24	4.23	4.23	4.24
Brigantine Junc	43.5	4.28	4.29	4.29½	4.29	4.28	4.27	4.27	4.27	4.28	4.27	4.27	4.27½	4.29	4.29	4.28	4.28½	4.28½	4.27½	4.30	4.27	4.27	4.26½	4.27	4.27½	4.26½	4.26½	4 27½
Pleasantville	50.5	4.33	4.34	4.34½	4.34½	4.33	4.33	4.33	4.33	4.34	4.32½	4.33	4.33	4.35	4.34½	4.33½	4.34	4.34½	4.33	4.35½	4.32½	4.32	4.32½	4.32½	4.33½	4.31½	4.32	4.33
Meadow Tower	53.8	.....	4.36½	4.37½	4.37	4.36	4.35½	4.35½	4.35½	4.37	4.35	4.35½	4.35½	4.37½	4.37½	4 36½	4.36½	4.36½	4.35	4.38	4.35	4.35	4.35	4.35½	4.36	4.34	4.35	4.36
Atlantic City	55.5	4.40	4.38½	4.39	4.39½	4.38½	4.37½	4.37½	4.38	4.38½	4.37½	4.38	4.37½	4.39½	4.39½	4.38½	4.38½	4.38½	4.37½	4.40	4.38	4 38	4.38½	4.38½	4.38½	4.37½	4.38	4.37½
Number of Cars	.....	.....	6	6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	5	6	5	6	5	5	5
Passengers carried	.....	.....	252	238	265	185	286	383	223	262	257	283	292	448	267	292	236	232	276	396	178	190	211	195	259	370	147	166
Running Time	.....	.....	46½	47½	48	48	47½	48	47½	48	48	48	47½	48	47½	46½	47½	47	46½	48½	48½	48½	49	49	48½	48½	47½	46½
Miles per hr. (av'e)	.....	.....	71.2	70.1	69.3	69.3	70.4	69.3	69.7	69.3	69.3	69.3	70.1	69.3	69.7	71.2	70.1	70.8	71.2	69.0	68 6	68.6	67.9	67.9	68.3	69.0	69.7	71.2

Performance of Train No. 25 for July and August, 1897

Copy of Train Despatcher's sheet, showing running time of train, to which is added a statement showing number of cars in train, number of passengers carried and average number of miles per hour for each trip.



Locomotive 102

The locomotives of this class were designed to burn bituminous coal. They had long narrow fireboxes placed above the frames but between the driving wheels. This design was later modified to use a wide firebox placed above the rear drivers, thus increasing the grate area to 47.5 sq. ft.

Built by the Baldwin Locomotive Works in January, 1899, 102 was later renumbered 963, class 1-7-a, in April, 1900. It was retired in November, 1928. No. 972 is the only one of the 20 locomotives in this class which remains at the present time.

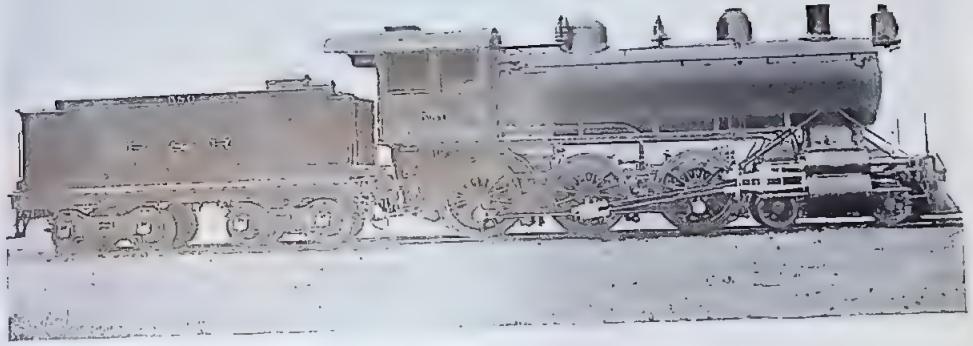
Cylinders .....22" x 28"	Heating Surface...2,001 sq. ft.
Drivers .....55½"	Weight on Drivers. 147,750 lbs.
Boiler Pressure .....180 lbs.	Total Weight .....165,050 lbs.
Grate Area .....33 sq. ft.	Tractive Force .....37,400 lbs.

Locomotive 580

The last of 29 similar locomotives of its class, 580 was originally designed to burn bituminous coal in a wide firebox over the rear drivers. It was built with compound cylinders as a fast freight locomotive by the Baldwin Locomotive Works in August, 1900, Class L-4-b. In February, 1929, the engine was rebuilt with a new boiler and firebox, middle cab, and Walscheart valve gear; reclassified L-3-s-e, and assigned to passenger service.

Cylinders, 14" and 24" x 26"	Weight on Drivers, 111,400 lbs.
Drivers .....61"	Total Weight. 157,300 lbs.
Boiler Pressure..200 lbs.	Tractive Force, 23,415 lbs.*
Grate Area ...47.5 sq. ft.	
Heating Surface, 2,318 sq. ft.	

* *Working Compound.*



Locomotive 322

There were six Atlantic 4-4-2 type locomotives in the same class as 322, all of which were built by the Baldwin Locomotive Works in May, 1900. The 84¼" drivers were among the largest wheels then used in the United States.

Originally built with compound cylinders and classified P-3-a, locomotive 322 was changed to a single expansion engine in January, 1904, class P-3-c. In December, 1914, it was again rebuilt to class P-3-d. when a Walscheart valve gear was added. It was retired in 1933.

Cylinders, 15" and 25" x 24"	Heating Surface ..2,550 sq. ft.
Drivers .....84¼"	Weight on Drivers..89,900 lbs.
Boiler Pressure .....220 lbs.	Total Weight .....168,500 lbs.
Grate Area .....80.7 sq. ft.	Tractive Force...18,800 lbs.*

* *Working Compound.*

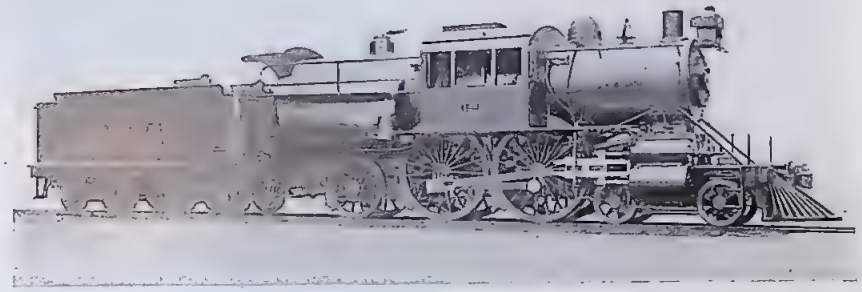
Locomotive 329

Built originally as a compound engine by the Baldwin Locomotive Works in June, 1902, this locomotive was then classified P-4-a and it was changed to a single expansion engine in January, 1904.

Of the two engines in this class, 329 was the last compound built for the Reading, and 328 differed only in that it had single expansion cylinders. No. 329 was retired in March, 1933.

Cylinders..15" and 25" x 24"	Heating Surface ..2,948 sq. ft.
Drivers .....84¼"	Weight on Drivers..89,900 lbs.
Boiler Pressure .....225 lbs.	Total Weight .....176,300 lbs.
Grate Area .....79.3 sq. ft.	Tractive Force...19,620 lbs.*

* *Working Compound.*



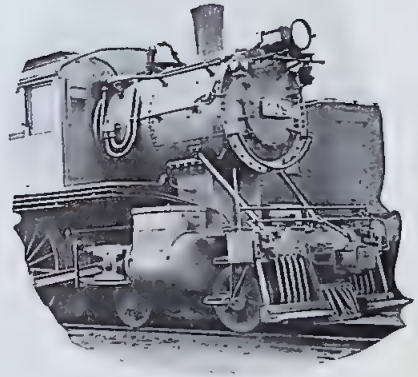
Locomotive 260

Cylinders	21″ x 22″
Drivers	68½″
Boiler Pressure	200 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,941 sq. ft.
Weight on Drivers	89,000 lbs.
Total Weight	135,000 lbs.
Tractive Force	21,800 lbs.

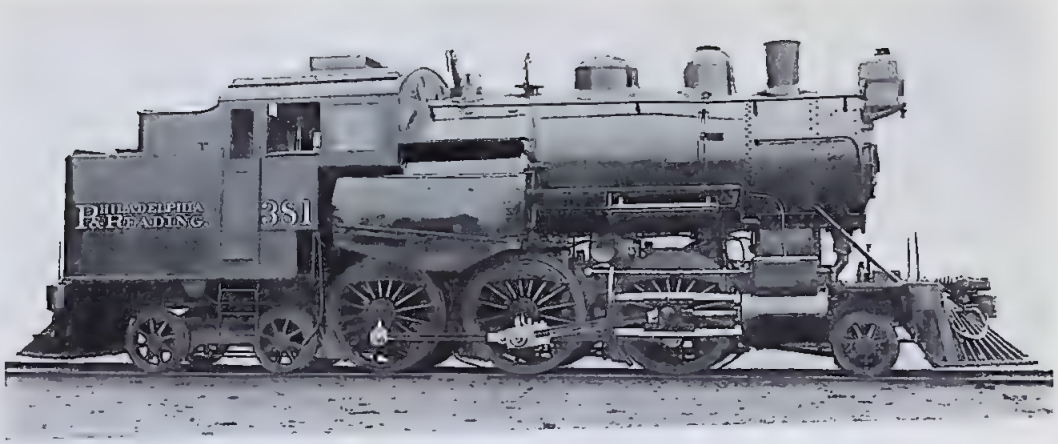
There were 35 locomotives in classes D-5-f and D-5-h, of which 260 was the first. (The "f" and "h" classes differ only in minor details.) All were built by the Baldwin Locomotive Works, and of these, only one engine, 269, remains on the roster.

Built for heavy suburban passenger service, these engines also made short express runs on the Bethlehem Branch and the midnight express to Jersey City. They were equipped with boilers of the modified Wootten type without combustion chambers.

No. 260, class D-5-f built in May, 1901, was never rebuilt and was last run on the Newtown Branch before its retirement in October, 1933.



Locomotive 269



Locomotive 381

Cylinders	20" x 24"
Drivers	61½"
Boiler Pressure	200 lbs.
Grate Area	68.5 sq. ft.
Heating Surface	1,969 sq. ft.
Weight on Drivers	120,860 lbs.
Total Weight	201,700 lbs.
Tractive Force	26,540 lbs.

The ten locomotives of class Q-1 were known as double-end tank locomotives. They were used in suburban service, chiefly on the Chestnut Hill Branch, where it was impossible to turn locomotives with separate tenders at the end of the run at Chestnut Hill. Because of this and since it was a short run, a larger tender was not needed.

Locomotive 381 was built in September, 1903, by the Baldwin Locomotive Works. In August, 1921, a Walscheart valve gear was applied and the engine was reclassified Q-1-c. The engine was finally retired in January, 1934. This class is now extinct but was in active service until electrification of the Philadelphia suburban area in July, 1931.

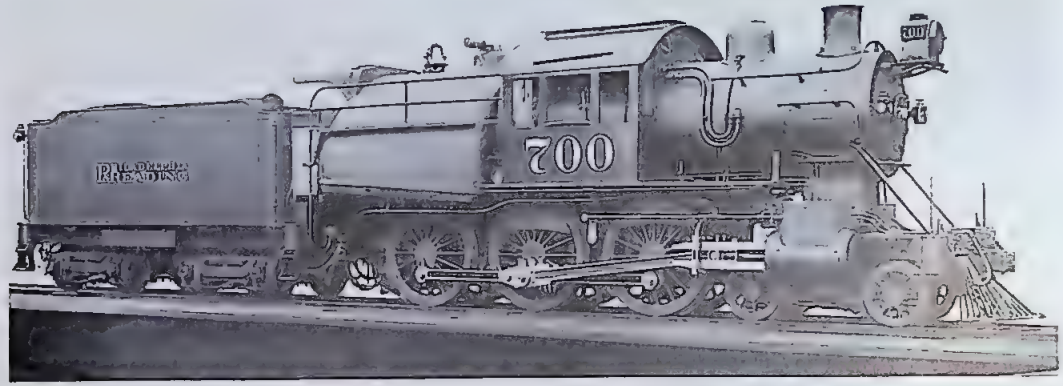
Locomotive 604

Built for fast freight service by the Baldwin Locomotive Works in October, 1905, engine 604 was classified L-7-a.

The locomotive was superheated in June, 1919, and reclassified L-7-s-b. There were 14 in this class, most of which remain in service.

Cylinders	22" x 28"
Drivers	68½"
Boiler Pressure	210 lbs.
Grate Area	90.4 sq. ft.
Heating Surface	2,961 sq. ft.
Weight on Drivers	165,700 lbs.
Total Weight	214,000 lbs.
Tractive Force	35,300 lbs.

Locomotive 700



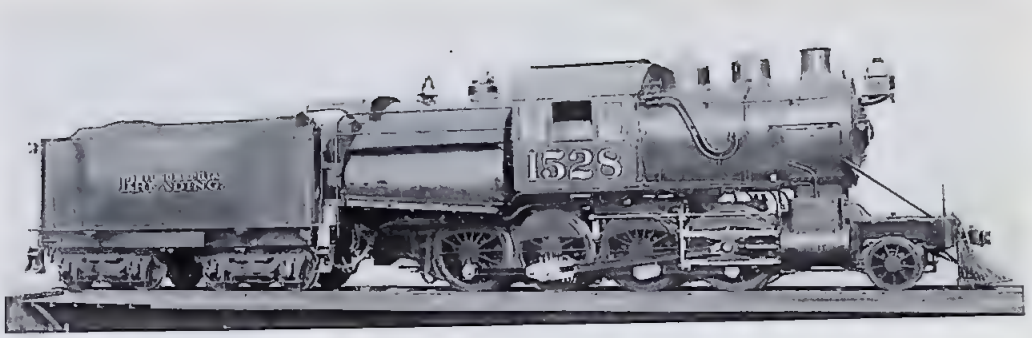
Locomotive 700, class L-8-a, was one of ten locomotives built by the Baldwin Locomotive Works for fast freight service in June, 1906. In May, 1923, 700 was changed to class L-8-s-c when a Walscheart valve gear and superheater were applied.

Cylinders	21" x 26"
Drivers	68½"
Boiler Pressure	200 lbs.
Grate Area	85.5 sq. ft.
Heating Surface	2,375 sq. ft.
Weight on Drivers	151,025 lbs.
Total Weight	196,125 lbs.
Tractive Force	28,450 lbs.

Locomotive 1528

No. 1528 is one of 65 class I-8-a locomotives ordered from the Baldwin Locomotive Works in 1905. When built these 2-8-0 locomotives were operated in heavy freight service, and today many continue in local work. In 1910, 1912-1914, 52 similar engines were built at Reading Shops, class I-8-a, I-8-b and I-8-c.

No. 1528, class I-8-a, was rebuilt in December, 1914, with Walscheart valve gear and is representative of the changes which many class I-8-a underwent, and reclassified I-8-b and I-8-s-b.

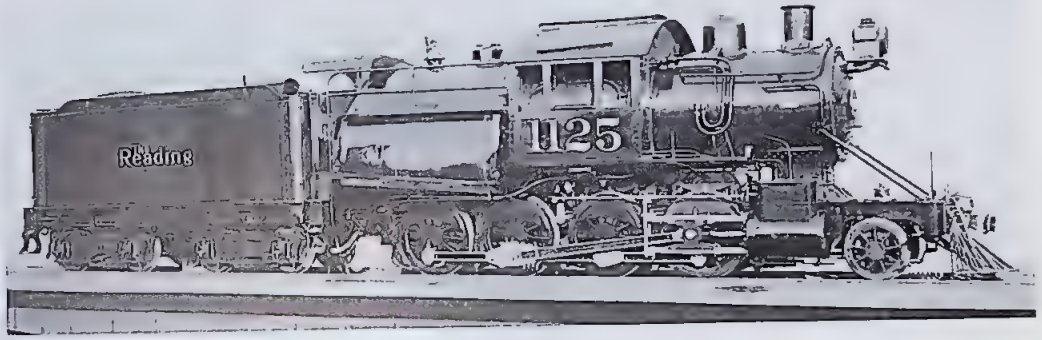


I-8-a

Cylinders	22½" x 30"	Heating Surface	2,767 sq. ft.
Drivers	61½"	Weight on Drivers	180,000 lbs.
Boiler Pressure	210 lbs.	Total Weight	205,000 lbs.
Grate Area	90 sq. ft.	Tractive Force	44,080 lbs.

Locomotive 1125

This locomotive, built by the Baldwin Locomotive Works in February, 1907, was one of 15, class I-6-c. These were similar in design to class I-8, but of somewhat smaller dimensions and not as heavy. The first six of the group of I-6 locomotives were rebuilt from class I-7 by substituting Wootten boilers for the original soft-coal burning engines. Engine 1125 was changed to class I-6-d and a Walscheart valve gear was applied in June, 1921. Retired in June, 1935.



Cylinders	22" x 28"	Heating Surface	2,237 sq. ft.
Drivers	55"	Weight on Drivers	160,000 lbs.
Boiler Pressure	185 lbs.	Total Weight	185,000 lbs.
Grate Area	85.8 sq. ft.	Tractive Force	38,800 lbs.

Locomotive 340

In 1906, ten notable Atlantic type locomotives of class P-5, 340 to 349, were built at the Reading Shops. They were among the heaviest 4-4-2 type locomotives in existence at the time, and with their large boilers, cylinders and driving wheels, were well fitted for handling heavy trains at high speed. As built, they used saturated steam and had slide valves and Stephenson valve motion. They were subsequently rebuilt with superheater, piston valves and Walscheart valve motion. Several of the group now have driving wheels 80 inches in diameter, but five retain driving wheels of 86 inches diameter, at present the largest wheels in the United States. No. 344, illustrated on page 77, for a time had three cylinders.

Cylinders	21" x 27"	Heating Surface	3,270 sq. ft.
Drivers	86"	Weight on Drivers	125,900 lbs.
Boiler Pressure	230 lbs.	Total Weight	223,200 lbs.
Grate Area	94.5 sq. ft.	Tractive Force	27,067 lbs.

Locomotives 303 and 344

The two locomotives illustrated on this page were unusual in that they each had three cylinders, two outside and one inside, with cranks placed 120 degrees apart. They were built at the Reading Shops and did notable work in high-speed passenger service. No. 303 was built new in June, 1909, and 344 was rebuilt from class P-5-a in May, 1912. The piston valve for the inside cylinder was operated by Joy valve gear, while the outside cylinders had Walscheart gear. No. 344 was the first Reading locomotive to have a Schmidt superheater and the letter S in this and other classifications indicate that the locomotives are superheated.

A third 4-4-2, No. 300 was similar to No. 303 and also had three cylinders as built. Locomotives 300, 303 and 344 were subsequently rebuilt with two cylinders in April, 1917, June, 1916, and June, 1917.

Locomotive 303

Locomotive 344

	303	344
Cylinders	18½" x 24"	19" x 24"
Drivers	80"	80"
Boiler Pressure	225 lbs.	230 lbs.
Grate Area	90 sq. ft.	94.5 sq. ft.
Heating Surface	2,850 sq. ft.	2,176 sq. ft.
Superheating Surface	———	659 sq. ft.
Weight on Drivers	117,575 lbs.	124,875 lbs.
Total Weight	226,700 lbs.	230,025 lbs.
Tractive Force	29,454 lbs.	31,759 lbs.

Locomotive 100

Most inspection engines were incapable of pulling more than one or two cars, but the Reading's famous No. 100 could pull a complete passenger train. It was the last inspection engine built by the Philadelphia and Reading Shops, and the only Atlantic type inspection engine in the United States. Built in June, 1913, it was unclassified and was retired in April, 1929.

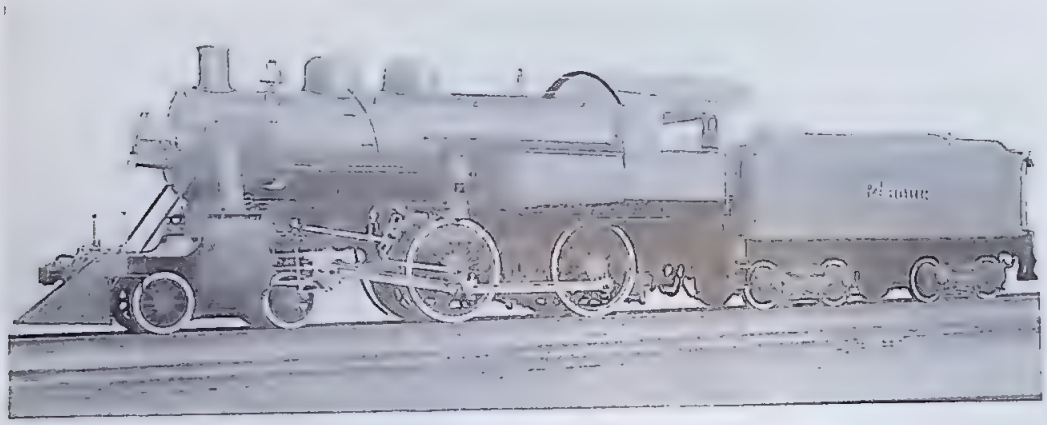
Cylinders	18" x 24"
Drivers	68½"
Boiler Pressure	200 lbs.
Grate Area	63 sq. ft.
Heating Surface	1,274 sq. ft.
Weight on Drivers	97,575 lbs.
Total Weight	160,700 lbs.
Tractive Force	19,300 lbs.

Locomotive 419

No. 419 is one of the ten locomotives, class D-11-s, built by the Baldwin Locomotive Works in March, 1914. This was the last large order of 4-4-0 American type locomotives built for an American railroad. They were first used in express passenger service on the Bethlehem Branch and other lines.

This group is the Reading's only 4-4-0 type with an end cab. They were fitted with superheaters, piston valves, and Walscheart valve gear when built. All of this class are still in existence. No. 419 is at present operating in work-train service.

Cylinders	21" x 24"	Superheating Surface,	363 sq. ft.
Drivers	68½"	Weight on Drivers	120,528 lbs.
Boiler Pressure	210 lbs.	Total Weight	173,490 lbs.
Grate Area	85 sq. ft.	Tractive Force	27,580 lbs.
Heating Surface	1,471 sq. ft.		

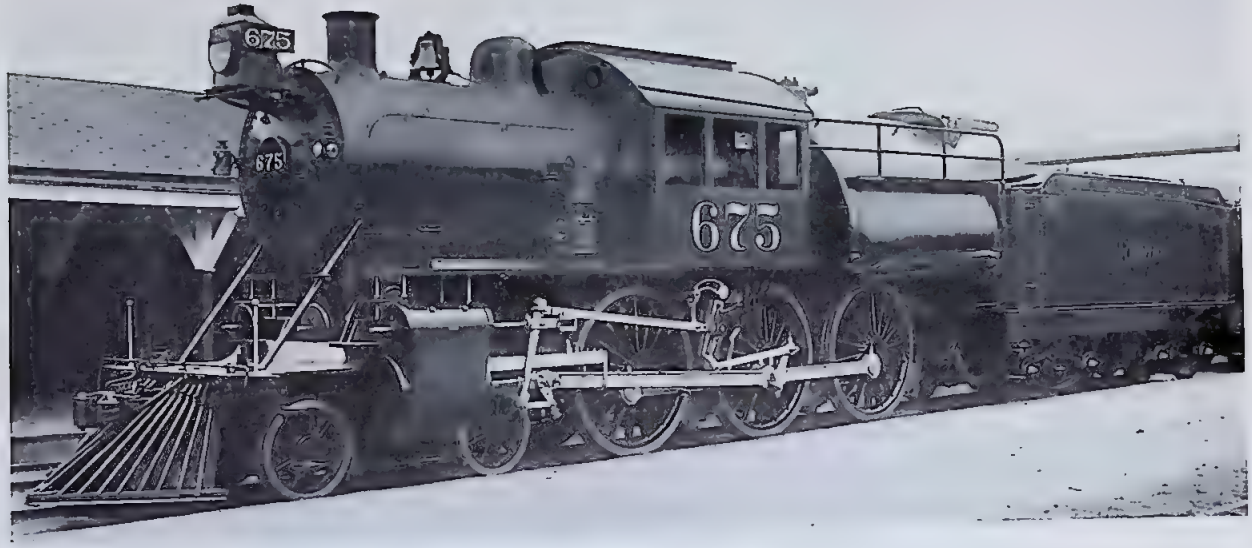


Locomotive 405

Completed at Reading Shops in April, 1911, this is one of ten American type locomotives built for heavy local passenger service. This D-8-c class represents the highest development of the Wootten firebox, American type locomotive with a middle cab.

Locomotive 405 and the others of its class were used regularly until the advent of electrification in 1931. No. 405 was retired in June, 1935.

Cylinders	20" x 24"
Drivers	68½"
Boiler Pressure	200 lbs.
Grate Area	76 sq. ft.
Heating Surface	1,910 sq. ft.
Weight on Drivers	115,250 lbs.
Total Weight	166,925 lbs.
Tractive Force	23,800 lbs.

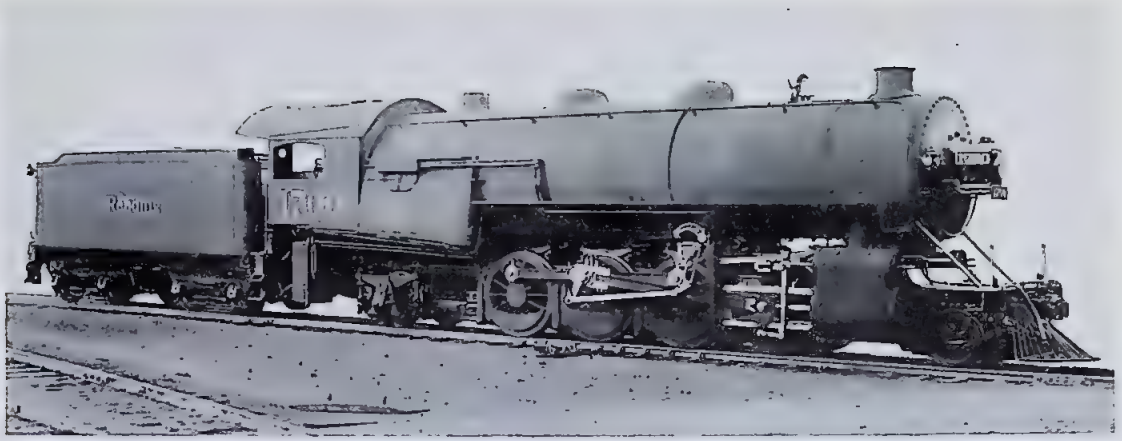


Locomotive 675

No. 675, a three-cylinder, ten-wheeler, was built in June, 1911, as class L-10-a in addition to 300 and 303, which were three-cylinder Atlantic types. The center cylinder of these three engines had a Joy valve gear, while the outside cylinders were equipped with conventional Walscheart valve gears. This illustration shows the locomotive on exhibition at Atlantic City during a convention of the Master Mechanics Association, where it was admired because of its handsome design and fine workmanship. A contemporary locomotive, No. 676, was similar except that it had two cylinders, measuring 22″ x 26″, and was classed L-10-b. These two locomotives are the heaviest middle cab, ten-wheeled locomotives on the Reading.

Locomotive 675 was capable of running 90 M.P.H. without forcing. In July, 1916, it was rebuilt into a two-cylinder engine, class L-10-b, and a Schmidt superheater was applied in July, 1923. Still in active service.

Cylinders (3)	19″ x 24″	Heating Surface	3,085 sq. ft.
Drivers	74″	Weight on Drivers	172,600 lbs.
Boiler Pressure	240 lbs.	Total Weight	226,750 lbs.
Grate Area	90 sq. ft.	Tractive Force	35,827 lbs.



Locomotive 1700

No. 1700, the first Mikado or 2-8-2 type on the Reading, was built at Reading Shops in 1912 for heavy freight service. As built, it was classified M-1-a, and later it was superheated, class M-1-s-a.

The engine originally was equipped with a screw reverse but this was later removed and an air-actuated power reverse applied. The original cylinders were 24″ x 32″, and were later enlarged when the superheater was applied.

Two years later in 1914 The Baldwin Locomotive Works built six more of these engines and from then on until 1917, 56 more were added, making a total of 57 in all. These locomotives continue in service.

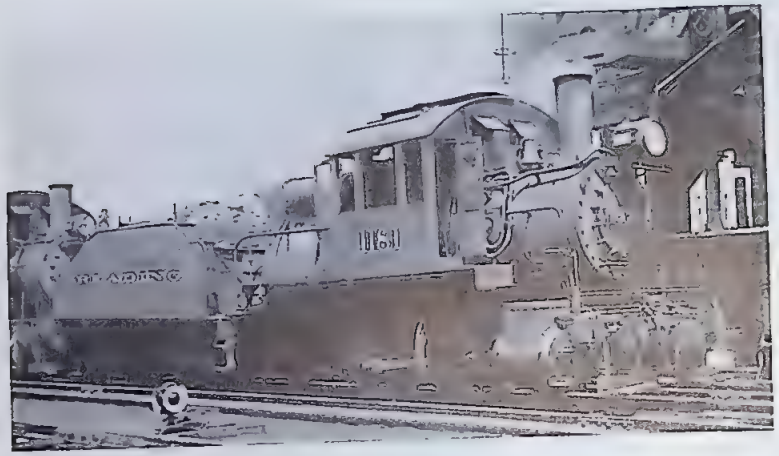
Cylinders	24″ x 32″	Heating Surface	5,508 sq. ft.
Drivers	61½″	Weight on Drivers	249,700 lbs.
Boiler Pressure	225 lbs.	Total Weight	334,425 lbs.
Grate Area	108 sq. ft.	Tractive Force	57,320 lbs.

Locomotive 1248

Built by Baldwin Locomotive Works in June, 1902, this 0-4-0 type switching locomotive was classified A-4-a. In January, 1907, it was partially rebuilt and reclassed A-4-b.

The 20 locomotives of this class were especially suitable for working near warehouses and wharves and over tracks laid in city streets, where it is impossible to traverse sharp curves with a six-coupled engine.

Cylinders .....16" x 24"	Heating Surface .....1,033 sq. ft.
Drivers .....50"	Total Weight .....104,800 lbs.
Boiler Pressure .....200 lbs.	Tractive Force .....20,890 lbs.
Grate Area .....40 sq. ft.	



Locomotive 1181

This switch engine was built by Baldwin Locomotive Works in February, 1906, class A-5-a. It was the first of 38 locomotives of this group, 19 of which were built by the Philadelphia and Reading. This photograph was taken in Reading, Pa., in May, 1936. A majority of these engines remain in service.

Cylinders .....18" x 24"	Heating Surface...1,143 sq. ft.
Drivers .....50"	Total Weight .....110,450 lbs.
Boiler Pressure .....185 lbs.	Tractive Force .....24,455 lbs.
Grate Area .....40 sq. ft.	

Locomotive 1343

There were 36 locomotives in class B-7-a built by Baldwin Locomotive Works and the Philadelphia & Reading, from February, 1906, to January, 1912. This particular engine was built in July, 1907, by Baldwin's and the photograph was taken at the coal docks at Bridgeport, Pa., in March, 1935.

Cylinders	20″ x 28″	Heating Surface	1,528 sq. ft.
Drivers	55″	Total Weight	162,100 lbs.
Boiler Pressure	200 lbs.	Tractive Force	34,620 lbs.
Grate Area	81 sq. ft.		

Locomotive 1453

There were 20 of these 0-6-0 switchers, class B-9-a, built at the Reading Shops from December, 1916, to March, 1918, and all continue in service. Locomotive 1453 was built in December, 1917.

Cylinders	23″ x 28″	Heating Surface	1,617 sq. ft.
Drivers	55½″	Total Weight	169,800 lbs.
Boiler Pressure	185 lbs.	Tractive Force	41,900 lbs.
Grate Area	81 sq. ft.		

Locomotive 1355

This is one of ten 0-8-0 switchers, E-3-a, built by the Baldwin Locomotive Works in September, 1905. The series was renumbered 1400-1409 in 1911. No. 1355 was renumbered 1404, as class E-3-b, rebuilt with Walscheart valve gear in August, 1915, and retired October, 1940.

Cylinders .....21″ x 28″	Heating Surface ..1,842 sq. ft.
Drivers .....55″	Total Weight .....177,710 lbs.
Boiler Pressure .....200 lbs.	Tractive Force.....39,120 lbs.
Grate Area .....81 sq. ft.	

Locomotive 1497

This class of locomotive, of which there are ten in number, are the most powerful switchers on the Reading. No. 1497, class E-5-s-a, was built by The Baldwin Locomotive Works in August, 1924, and is at present used at Rutherford, Pennsylvania, where the photograph was taken in May, 1939.

Cylinders .....26″ x 32″	Superheating Surface, 562 sq. ft.
Drivers .....55½″	
Boiler Pressure .....215 lbs.	Total Weight .....280,610 lbs.
Grate Area .....80.7 sq. ft.	Tractive Force.....71,250 lbs.
Heating Surface..2,718 sq. ft.	

Locomotives 110 and 351

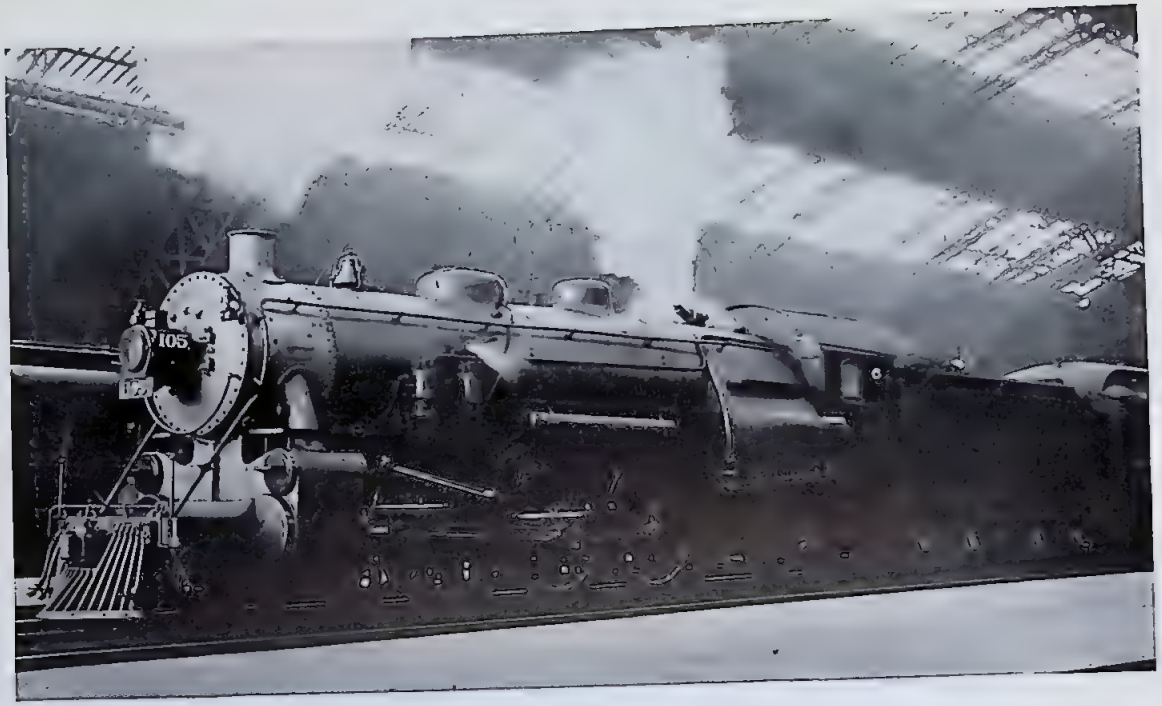
In the summer of 1915, four fast passenger locomotives of the 4-4-4 type, class C-1-a, road numbers 110-113, were built at the Reading Shops. The front and rear trucks were alike in design and were center bearing, thus providing a four-point suspension system. Among other unusual features were V-shaped guides, aluminum crossheads, a wire cable reverse gear, and rear frames of slab section. As built these locomotives were very unstable, and in 1916 they were rebuilt at Reading Shops as Atlantic (4-4-2) type engines with a normal three-point suspension system. They were reclassed as P-7-s-a and renumbered 350,353.

These locomotives are notable because of high tractive force and steaming capacity attained in an engine with two pairs of driving wheels. This class is still doing good work on Main Line passenger trains.

	110	351
Cylinders	23½" x 26"	23½" x 26"
Drivers	80"	80"
Boiler Pressure	240 lbs.	215 lbs.
Grate Area	108 sq. ft.	94.5 sq. ft.
Heating Surface	2,490 sq. ft.	2,470 sq. ft.
Superheating Surface	684 sq. ft.	684 sq. ft.
Weight on Drivers	133,000 lbs.	129,210 lbs.
Total Weight	230,800 lbs.	231,925 lbs.
Tractive Force	36,604 lbs.	32,800 lbs.

Locomotive 110

Locomotive 551



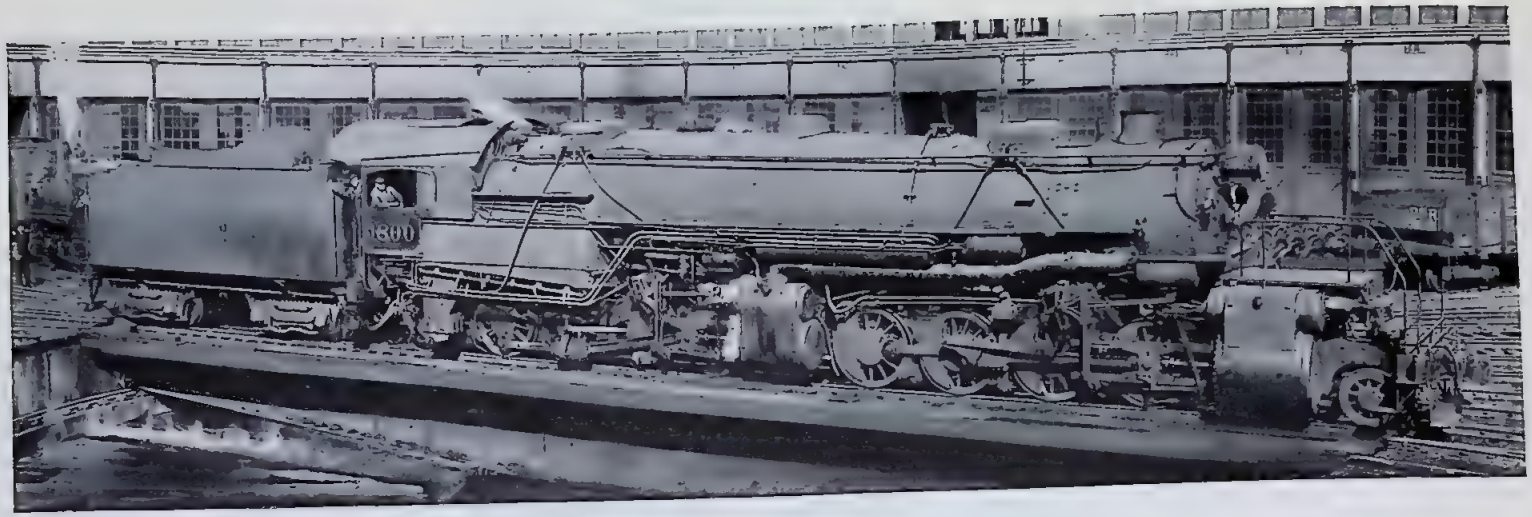
Locomotive 105

The locomotives of this class, the first of the Pacific type on the Reading, were primarily built to handle through trains of the Baltimore & Ohio Railroad between 24th and Chestnut Streets, Philadelphia, and Jersey City, N. J. These trains became too heavy for the Atlantic type engines, but the G-1-s-a class, with large fireboxes and boilers, and driving wheels 80 inches in diameter, combined hauling power and speed to a notable degree. The machinery details are of light design, and the general appearance of the locomotives is suggestive of speed. These engines also proved their ability to do good work on the Atlantic City run, where train loads were becoming too heavy for the Atlantic type locomotive.

No. 105 was completed in June, 1916, and was the first of 30 locomotives of its class, of which 25 were built at the Philadelphia & Reading Shops at Reading, Pennsylvania, and the remainder by The Baldwin Locomotive Works. The engine is still in high-speed passenger service.

Cylinders	25" x 28"
Drivers	80"
Boiler Pressure	220 lbs.
Grate Area	94.5 sq. ft.
Heating Surface	2,983 sq. ft.
Superheating Surface	621 sq. ft.
Weight on Drivers	176,925 lbs.
Total Weight	273,600 lbs.
Tractive Force	40,900 lbs.

No. 132 leaving Camden Yards for a mile a minute run to Atlantic City. This locomotive was one of five (Nos. 130-134) built by The Baldwin Locomotive Works in June, 1924, and the latest of the class G-1-s-a.



Locomotive 1800

The Baldwin Locomotive Works completed 31 Mallet articulated compound locomotives from March, 1917, to September, 1919, which were designed for the heaviest class of freight and pushing service. They were of the 2-8-8-2 type with four pairs of driving wheels in each group; the high-pressure cylinders driving the rear group of wheels and the low-pressure the forward group. The boilers had Wootten fireboxes and were of the largest dimensions permitted by weight and clearance limitations, the grate measuring 12 ft. long and 9 ft. wide. The fuel used was a mixture of buckwheat anthracite and bituminous coal, fired with mechanical stokers. To develop high tractive force in starting, steam at reduced pressure could be admitted direct from the boiler to the low-pressure cylinders. Eleven locomotives of the N-1-s-a class, 1800-1810, were rebuilt from 1927 to 1930 in the Reading Shops, into class K-1-s-a and K-1-s-c Santa Fe, 2-10-2 type locomotives, and renumbered 3000-3010. No. 1800, class N-1-s-a, was built by The Baldwin Locomotive Works in March, 1917. It was rebuilt in August, 1928, and renumbered 3001, K-1-s-a.

Class N-1-s-a

Cylinders.....26″ and 40″ x 32″	Superheating Surface....1,450 sq. ft.
Drivers .....55½″	Weight on Drivers.....435,500 lbs.
Boiler Pressure .....210 lbs.	Total Weight .....478,500 lbs.
Grate Area .....108 sq. ft.	Tractive Force .....98,480 lbs.
Heating Surface .....5,763 sq. ft.	

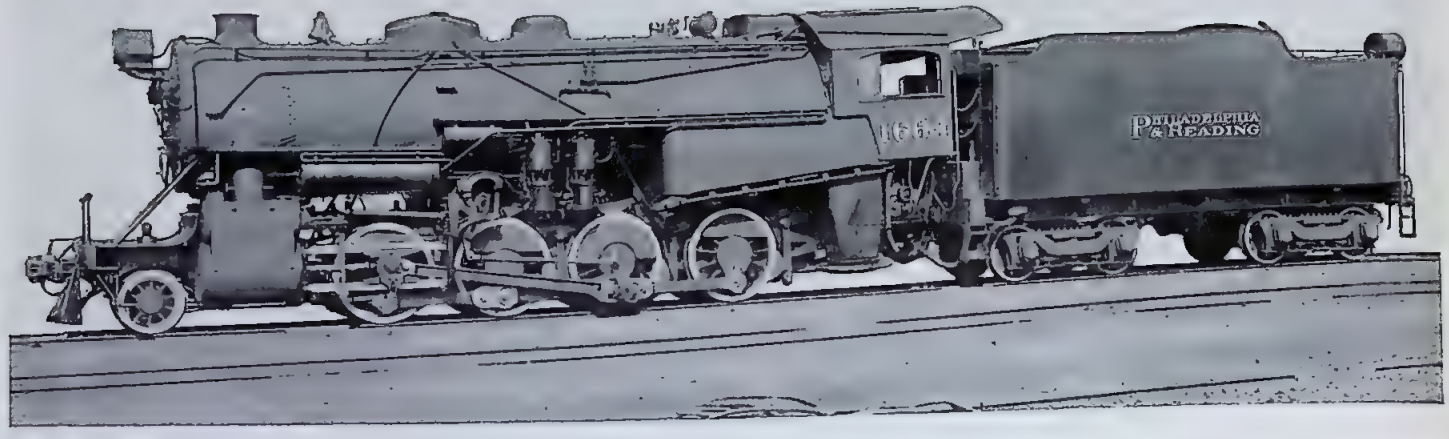
Locomotive 1821

The locomotives of the 1800 class, as originally built with compound cylinders, were suitable for only slow-speed service. When operated at higher speeds there was excessive back pressure on the low-pressure pistons, and maintenance charges were abnormally high. Up to January 31, 1941, four of these locomotives had been rebuilt with four single expansion cylinders and classified N-1-s-d, as shown in the above illustration. This permitted increasing the speed and capacity in addition to reducing cost of maintenance.

As shown, the live steam pipes pass out through the side of the smokebox, one leading back to the rear cylinders, and the other is fitted with flexible joints, leading to the front cylinders. The N-1-s-d class, Nos. 1811, 1816, 1818 and 1821, are the most powerful locomotives on the Reading. The remaining locomotives of class N-1 are being rebuilt into class N-1-s-d. Locomotive 1821 was built by The Baldwin Locomotive Works in June, 1919, and continues in service.

Class N-1-s-d

Cylinders (4)	23″ x 32″	Superheating Surface	1,450 sq. ft.
Drivers	55½″	Weight on Drivers	465,430 lbs.
Boiler Pressure	215 lbs.	Total Weight	500,700 lbs.
Grate Area	108 sq. ft.	Tractive Force	111,400 lbs.
Heating Surface	5,763 sq. ft.		

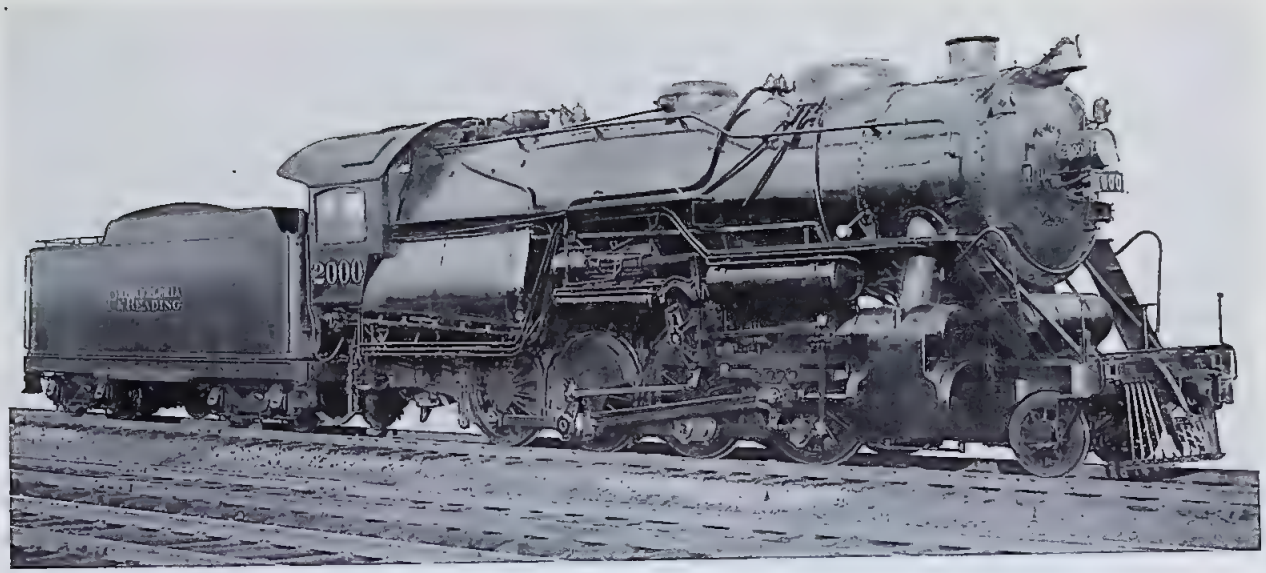


Locomotive 1664

The 1664 class I-9-s-a is a development of class I-8, with smaller drivers and a larger boiler fitted with a superheater. This is typically a "drag freight" engine. The boilers were designed to burn a mixture of buckwheat anthracite and bituminous coal, and a mechanical stoker was applied. The cab was placed at the rear instead of the middle of the boiler, a departure from the previous designs of Consolidation type locomotives having Wootten boilers. These locomotives are operated in heavy freight service over the entire Reading System.

No. 1664 carries The Baldwin Locomotive Works construction No. 51173 and was built in February, 1919.

Cylinders .....25" x 32"	Superheating Surface...1,103 sq. ft.
Drivers .....55½"	Weight on Drivers.....250,800 lbs.
Boiler Pressure .....200 lbs.	Total Weight .....281,100 lbs.
Grate Area .....94.9 sq. ft.	Tractive Force .....64,300 lbs.
Heating Surface.....2,645 sq. ft.	

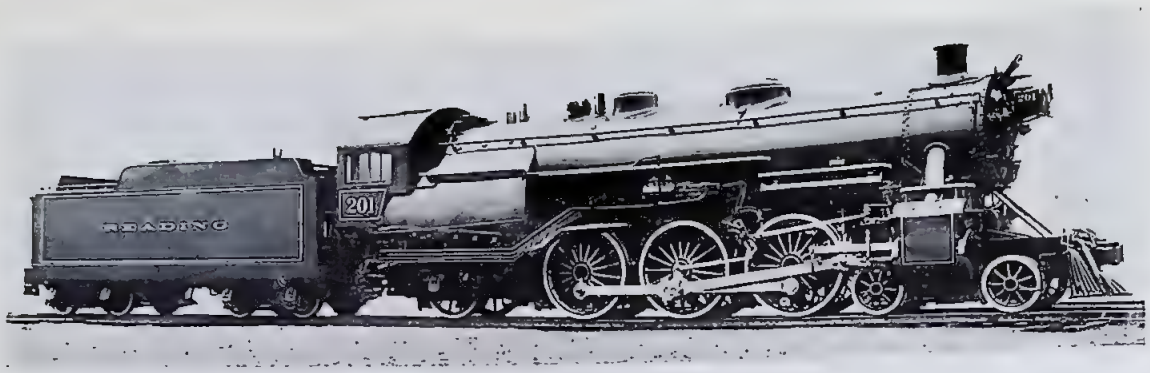


Locomotive 2000

This class is a direct development of class I-9. These I-10-s-a locomotives rank among the heaviest of the 2-8-0 type ever built. In comparison with Class I-9, they have larger wheels and boiler, and increased horsepower and speed capacity. There were 50 of the Class I-10 built from December, 1923, to January, 1926, by the Baldwin Locomotive Works, all of which are designed to burn a mixture of hard and soft coal mechanically stoked. No. 2000 was built in December, 1923.

The lettering, "Philadelphia and Reading," as shown on the tender of 2000 was discontinued January 1, 1924, when the corporate name of the road was changed to Reading Company.

Cylinders	27" x 32"
Drivers	61½"
Boiler Pressure	220 lbs.
Grate Area	94.5 sq. ft.
Heating Surface	3,328 sq. ft.
Superheating Surface	1,560 sq. ft.
Weight on Drivers	284,190 lbs.
Total Weight	314,950 lbs.
Tractive Force	71,000 lbs.

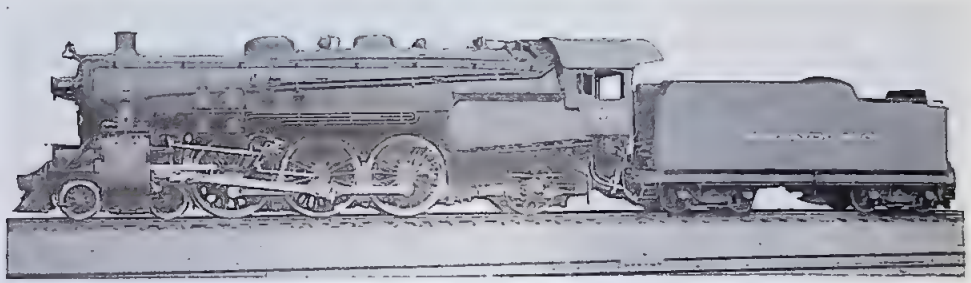


Cylinders	24″ x 28″
Drivers	74″
Boiler Pressure	220 lbs.
Grate Area	94.5 sq. ft.
Heating Surface	2,983 sq. ft.
Superheating Surface,	621 sq. ft.
Weight on Drivers	177,210 lbs.
Total Weight	288,120 lbs.
Tractive Force	44,200 lbs.

Locomotive 201

No. 201, class G-1-s-b, is one of five Pacific type locomotives, similar to the G-1-s-a but with 74″ drivers, especially designed for heavy Main Line and Bethlehem Branch passenger trains. No. 201, when built in May, 1925, by The Baldwin Locomotive Works, was painted dark blue, and handled Main Line train No. 92 southbound and No. 97 northbound. These engines continue in service.

Cylinders	25″ x 28″
Drivers	80″
Boiler Pressure	230 lbs.
Grate Area	94.5 sq. ft.
Heating Surface	3,391 sq. ft.
Superheating Surface	1 007 sq. ft.
Weight on Drivers	192,540 lbs.
Total Weight	306,360 lbs.
Tractive Force	42,800 lbs.



Locomotive 175

The G-2-s-a class illustrated above, built by The Baldwin Locomotive Works in June, 1926, is the latest Pacific type locomotive on the Reading. There are five of this class. The boilers are slightly larger than the G-1-s-a and G-1-s-b classes. No. 178 of the same class, now streamlined, is shown on page 101.

Locomotive 616

No. 616 is the only locomotive of class L-6-s-a. It was originally No. 603, class L-7-a, built by the Baldwin Locomotive Works in September, 1905. It was rebuilt and renumbered 616 in January, 1930. The cab was placed at the rear of the firebox, and a Caprotti valve gear applied. To connect the throttle valve in the dome with the cab at the rear, an external rod was applied as shown in the illustration. No. 616 for a time continued in passenger service, but is now out of service. The Caprotti valve with which No. 616 is equipped, is explained on page 95.

Cylinders	23" x 28"	Superheating Surface	840 sq. ft.
Drivers	68½"	Weight on Drivers	187,175 lbs.
Boiler Pressure	220 lbs.	Total Weight	235,400 lbs.
Grate Area	90 sq. ft.	Tractive Force	40,440 lbs.
Heating Surface	1,898 sq. ft.		

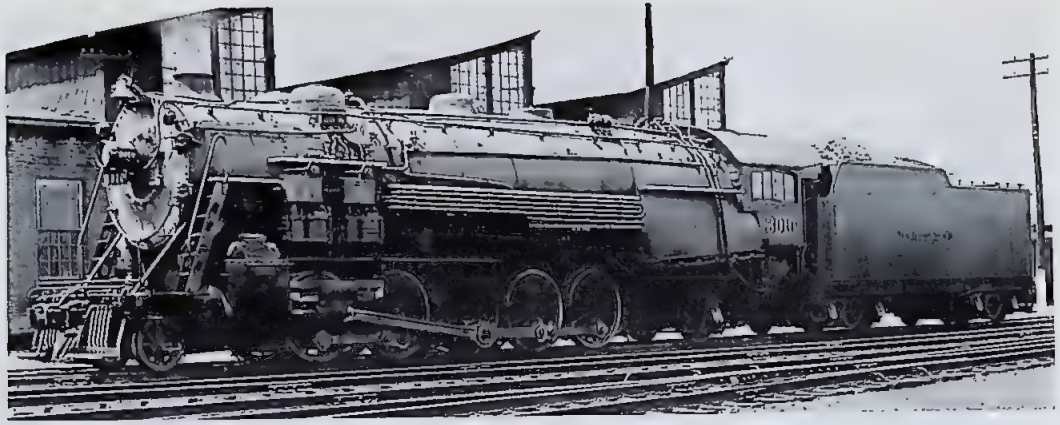
Locomotive 3000

The 3000 was the first of the powerful Santa Fe type locomotives rebuilt from the 2-8-8-2 type at the Reading Shops at Reading, Pa. This was an entirely new type of locomotive on the Reading and when constructed in 1927 was the heaviest and most powerful 2-10-2 type in the United States. These locomotives operate the heaviest freight runs on the Lebanon Valley and East Penn Branches of the Reading.

There were 11 of the K-1-s-a class rebuilt from the 2-8-8-2 type from 1927 to 1929 and ten class K-1-s-b built by Baldwin in 1931. Twenty of these engines are equipped with 19,000 gallon water tenders which have Commonwealth water-bottom underframes.

No. 3000, class K-1-s-a, was originally numbered 1801, class N-1-s-a when it was built by The Baldwin Locomotive Works in March, 1917.

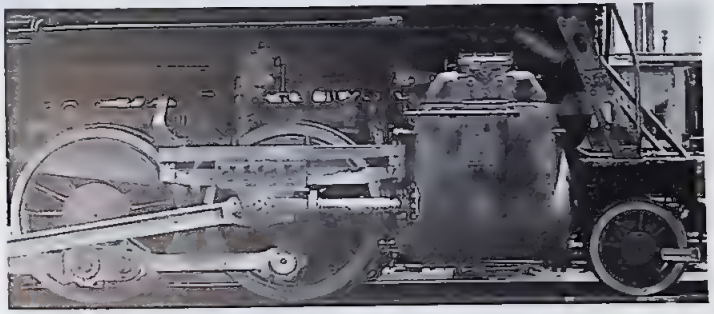
Cylinders .....30½" x 32"	Superheating Surface, 1,840 sq. ft.
Drivers .....61½"	Weight on Drivers, 353,050 lbs.
Boiler Pressure ...220 lbs.	Total Weight..439,800 lbs.
Grate Area .....108 sq. ft.	Tractive Force..90,500 lbs.
Heating Surface, 5,502 sq. ft.	



Locomotive 3010

Engine 3010 shown above, and No. 616 on page 93, were the only two locomotives on the Reading equipped with the Caprotti valve gear. The gear itself was invented by two Italians and is of the poppet valve type, having two inlet and two exhaust valves per cylinder. Motion is derived from bevel gears mounted on one of the axles and driving a longitudinal inclined shaft. This in turn drives two short transverse horizontal shafts which have coarse threads cut on them. By moving or sliding so-called cam shifters on this spiral thread, the position of the actuating cams can be altered angularly. Since these cams, through bell cranks, open and close the steam and exhaust valves, this alteration in angular position changes the admission, cut off and release of the steam. It is regarded as one of the most perfect valve motions in existence at this time and is used to a considerable extent in Europe.

The disadvantage of this valve gear is in its complicated mechanism, which results in a relatively high operating cost, chiefly because few mechanics have the ability to repair it.



OIL-ELECTRIC AND GAS-ELECTRIC LOCOMOTIVES

In general construction, the gasoline and the Diesel engines are nearly identical. The former draws in its fuel in the form of a gas, the gasoline being vaporized and mixed with the proper quantity of air. This fuel mixture is then compressed and fired by an electric spark. The Diesel engine draws in nothing but pure air and after this pure air is compressed, the fuel is sprayed into the cylinders in a very fine vapor and fired by the heat generated by compressing the air. This method of introducing the fuel is the fundamental difference between the two engines and is responsible for the much higher thermal efficiency of the Diesel engine. In gasoline engines, the maximum compression of the gas fuel mixture must be low enough to guard against pre-ignition of the charge due to heat of compression. In the Diesel, the compression pressures may be much higher because only air is involved.

Coupled to the crankshaft of the engine is an electrical generator which generates the electrical power to be transmitted to the traction motors, geared to the truck wheels of the car.

The first Rail Motor Car was placed in service on the Reading, August 1925, and the last car in service May 1930. During this period a total of sixteen such cars were purchased and operated principally between the following points:

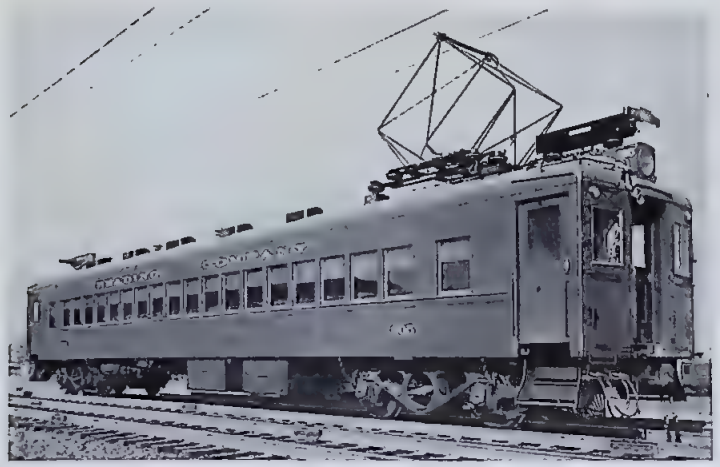
Coatesville, Reading and Lancaster.
Harrisburg and Reading.
Slatington and Reading.
New Hope and Hatboro.
Trenton, West Trenton and Bound Brook.

In addition, ten trailer cars were purchased to operate behind the motor cars and to be used where traffic conditions warranted.

Car No.	*Date Placed in Service*	*Horse-power*	*No. of Power Units*	*Passenger Carrying Capacity*	*Mail Compart-ment—Lbs.*	*Baggage Compart-ment—Lbs.*
O. E. 65	1932	125	1	47	....	....
G. E. 66	May 1930	600	2	30	5,000	13,000
G. E. 67	May 1929	500	2	30	5,000	9,000
G. E. 68	May 1929	500	2	47	5,000	6,500
G. E. 69	May 1929	500	2	30	5,000	9,000
O. E. 70	Oct. 1929	300	1	26	5,000	12,000
G. E. 71	May 1929	360	3	71	....	10,000
G. E. 72	May 1929	360	3	71	....	10,000
G. E. 73	Feb. 1928	600	2	30	5,000	6,500
O. E. 74	July 1929	300	1	41	5,000	10,000
G. E. 75	Aug. 1928	250	1	39	4,500	7,000
G. E. 76	Aug. 1928	360	3	39	4,500	7,000
G. E. 77	Feb. 1927	250	1	32	3,000	5,000
G. E. 78	Feb. 1927	250	1	32	3,000	5,000
G. E. 79	Feb. 1927	250	1	32	3,000	5,000
G. E. 80	Aug. 1925	250	1	50	....	537 cu. ft.

O. E. = Oil Electric Motor Car. G. E. = Gas-Electric Motor Car.

THE PHILADELPHIA SUBURBAN ELECTRIFICATION



Electric traction on the Philadelphia suburban lines was inaugurated on July 26, 1931. Since that date a speedy, frequent service has been furnished to suburban stations on the Reading System by a fleet of 120 electric cars of the most modern design.

The Reading electric cars are of the multiple unit (MU) type, each equipped with two motors, and so arranged that varying numbers may be coupled together and operated as a single train.

The control of the electric rolling stock is fully automatic. The rate of acceleration is governed by an accelerating relay; the electric heating of the cars is controlled by thermostats, and such devices as air compressors for the brakes operate with no attention from the engineman. The air brakes are electro-pneumatically applied and released, resulting in a more rapid application and release than is obtained with conventional air brakes.

Each motor car is powered by two motors each of 250 H.P. nominal rating. During acceleration, however, each car develops about 650 H.P. at the rail, thus giving rapid acceleration. The Reading electric suburban cars develop about 8 H.P. per ton of weight, as compared with about 2½ H.P. per ton with conventional steam trains.

Electric energy for train propulsion is drawn from an overhead contact wire at 12,000 volts and 25-cycle frequency. The source of energy is a frequency changer substation at Wayne Junction, where commercial electricity is furnished from the Philadelphia Electric Company's system. The power demand on the Wayne Junction substation reaches 26,000 KW during the peak hour, which is equivalent to a total load of 35,000 H.P.

In a normal day 359 scheduled inbound and outbound trains are handled in the Reading Terminal at Philadelphia, of which 75% are electric trains. Of the total passenger train miles produced annually by the Reading lines, 34% are contributed by electric trains in suburban service.

By virtue of the large amount of power developed per ton of weight on the Reading electric cars, very rapid schedule speeds—about 30% faster than steam trains—are maintained. With a 20-second stop every mile the scheduled speed is 27 miles an hour, and between stops 1 mile apart the speed attained is about 43 miles an hour. The maximum speed of the electric cars is 70 miles an hour.

Following are the principal data on the Philadelphia Suburban Electrification:

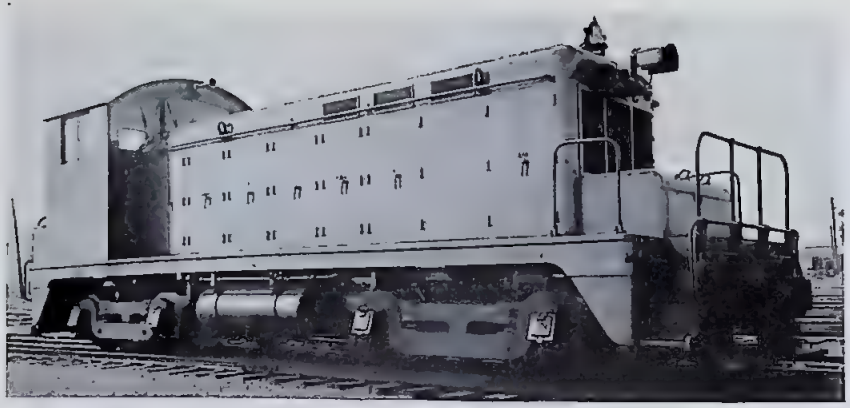
Track miles electrified	197
System of current	Alternating current, single phase, 25 cycles
Contact line voltage	12,000 volts
Power transmission voltage	36,000 volts
Number of substations	12
Number of electric motor cars	100
Number of electric trailer cars	20
Weight per motor car (light)	63.5 tons
Seating capacity each car	87
Overall length each car	72′ 10″
Motors per car	2, each of 250 H.P.
Maximum allowable speed	70 M.P.H.
Date in service	1931

Budd Car No. 65

In November, 1932, the Reading Company purchased from the Edw. G. Budd Manufacturing Co., Philadelphia, Pa., an oil-electric lightweight car for local Philadelphia service.

This car was equipped with a 125 H.P. Cummins type H, six-cylinder, 4⅞" x 6" Diesel oil engine direct connected to a generator and mounted on the forward truck. The electric driving motor was mounted on the rear or power truck.

The car, which had a seating capacity of 47 persons, was 50' 1" overall in length, weighed 23,400 lbs. in working order and was capable of maintaining a speed of 42 to 47 miles per hour. It was mounted on disc wheels which had a steel flange, but rubber tread. Rubber portion of tires was made by the Goodyear Company. A special rubber block inside the tire prevented collapsing if punctured. Both trucks were six-wheel with a rigid wheel base of 6' 8".



DIESEL SWITCHING LOCOMOTIVES

The idea of a Diesel engine was first developed by Dr. Rudolph Diesel when he built the original engine of this type in 1892. The first successful Diesel was constructed in 1897 and the first commercial Diesel in the United States, a 60-horsepower, two-cylinder unit, was built at St. Louis in 1898.

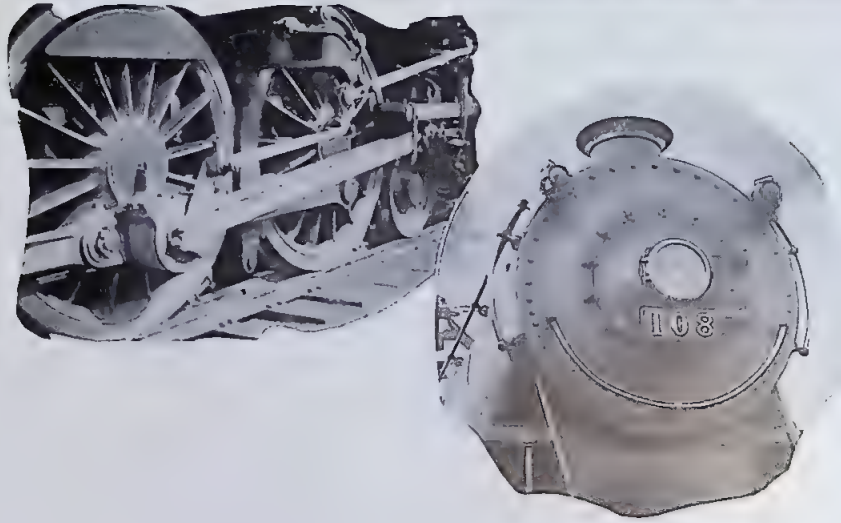
The Reading Company, on June 18, 1926, and March 22, 1928, bought two Ingersol-Rand 300-horsepower 60-ton Diesel switching locomotives. These two engines, numbered 50 and 51 respectively, were the second and third Diesel switchers placed in operation in the United States. They are still doing good work in the Philadelphia Territory as numbers 98 and 99, recently renumbered.

Six switching locomotives of 600 horsepower, built by the Electro-Motive Corporation, were placed in service by the Reading during November and December, 1937, as numbers 10-15. Since then, six other Diesels, numbers 17-22, have been ordered from the same firm, and also number 90, of 1000 horsepower—all of which are now in service.

In addition to these locomotives, number 36, later renumbered 60, made by The Baldwin Locomotive Works, was placed in service in June, 1939. This is a 660-horsepower, 100-ton locomotive with a De la Vergne engine. Locomotive numbers 61-63 of 660 horsepower and numbers 80 and 81, of 1000 horsepower, built by the Baldwin Locomotive Works, also are in service at the present time.

The American Locomotive Company recently built for the Reading, number 40, a 900-horsepower, 115-ton Diesel, placed in service January, 1939, and a duplicate, number 41, placed in service March, 1939. Numbers 50-52 of 600 horsepower are also new additions from the same firm.

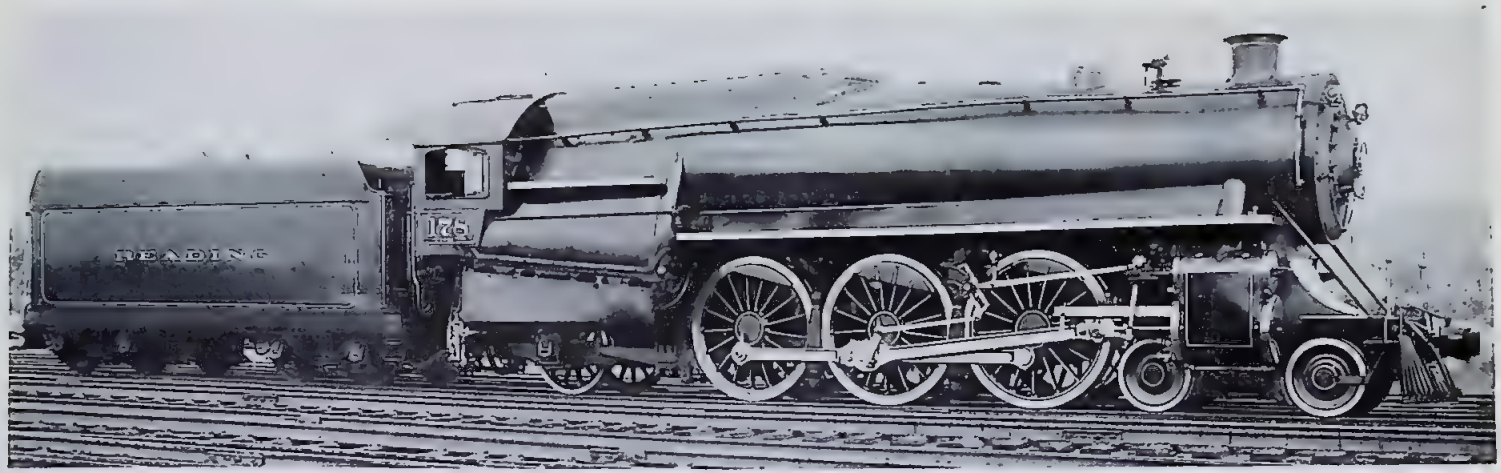
In January, 1940, number 35, a 600-horsepower, 100-ton Diesel, was purchased from the St. Louis Car Company. This locomotive contains a twin Fairbanks-Morse Diesel engine, and has since been renumbered 97.



Locomotive 108

This engine was built by the Reading Company in 1916 and classified G-1-s-a. This class is described on page 86.

In line with the more advanced styles in locomotive designing, the Reading Company semi-streamlined engine 108 at the Reading Shops in December, 1934. The locomotive was then assigned to the fastest trains between Philadelphia and New York.



Locomotive 178

No. 178 was built by Baldwin Locomotive Works in 1926, and was semi-streamlined by the Reading Shops in September, 1936. This locomotive is generally similar to No. 108, but is of a different class as described on page 92.

Immediately after semi-streamlining, 178 was placed on exhibition at Reading Fair, September, 1936. On Sunday, October 4, 1936, this locomotive hauled the Reading's first "Rail Ramble," running over a number of branch lines. No. 178 operates in passenger service between Philadelphia and New York.

"The CRUSADER" *Exemplification of Reading Progress*

The Crusader may be said to herald the introduction in the East of the ideal method of transporting passengers. Streamliners of similar type have been notably successful in the Middle West and West, as evidenced by record-breaking public use—but it remained for The Reading Company to introduce in December, 1937, these luxury trains in this territory with *The Crusader*.

Five cars of gleaming stainless steel—an observation car at each end, two coaches and a dining car with cocktail lounge—comprise *The Crusader*. If filled to capacity the train can accommodate 327 passengers, including the dining room and lounge seating facilities. Only as many tickets are sold, however, as there are coach seats—the train can't be crowded.

Passenger comfort is the predominating note. The Reading Company spent nearly half a million dollars to have the train built, omitting no detail that would assure safety, comfort and speed at all times. Despite the fact that no expense has been spared to make this the last word in traveling luxury, *The Crusader* is a "regular fare" train. The usual coach fare entitles the passenger to any of the train's seating accommodations.

The train is fully insulated and air-conditioned, and travelers ride in an atmosphere completely free of dirt and dust. With double-paned windows sealed against grime from the outside air, the designers were able to decorate with delicate pastel shades which make the train as a whole a symphony of gay but restful colors.

A world-famous architect, Paul P. Cret, was called upon to select finishes and color schemes—and out of his genius was created a most beautiful train interior. Coach seats throughout the entire train are of the individual reclining chair type—adjustable to the whims of each used. Reading

lights in all cars are adjustable and designed to illuminate without inconvenience to the passengers in adjoining seats.

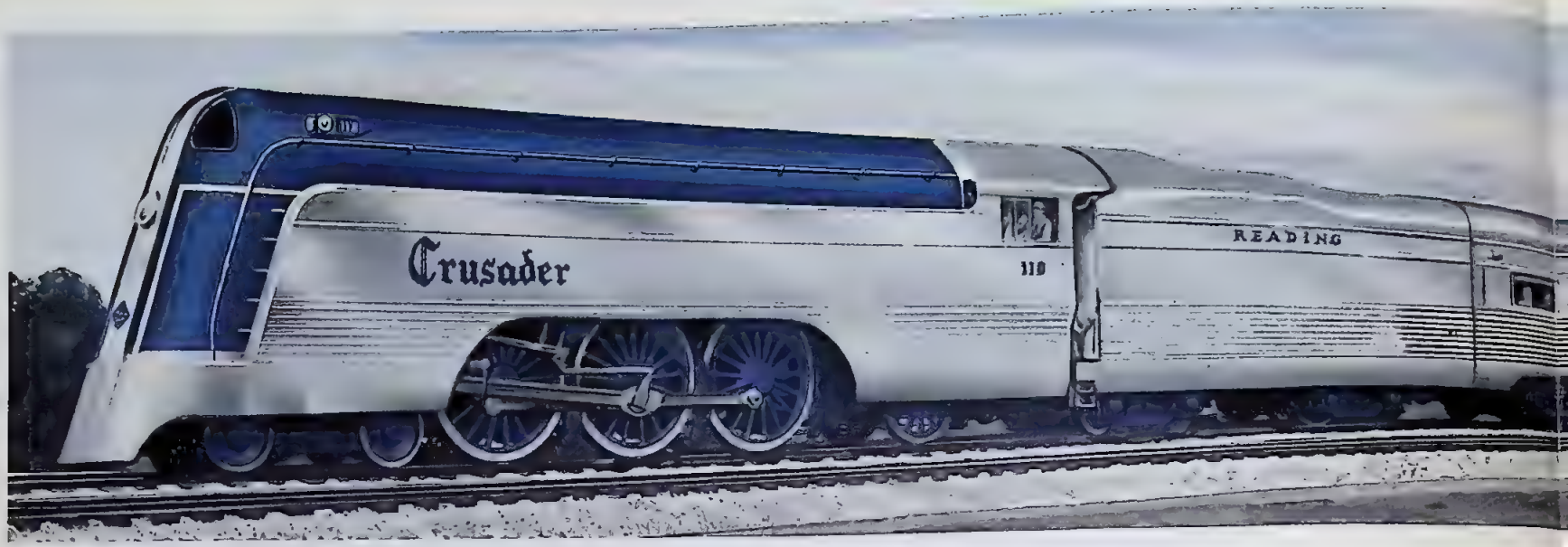
In the spacious and comfortable Dining Car the smooth, floating speed of *The Crusader* is most evident—you may enjoy your coffee and your entire meal in an atmosphere of cheer and distinct refinement.

The spic and span kitchen is as compact as a watch, yet here expert chefs prepare the delicious meals that are served at such moderate cost. An air curtain prevents cooking odors from penetrating the dining car.

By the use of stainless steel and the spotwelding of car sections the paramount thought of maximum safety has been carried out—yet operating economies are obtained through the saving in weight. An additional safety factor is the low center of gravity resulting from the fact that wheels and trucks are relatively heavier than the car bodies.

For power, The Reading Company chose good, old reliable steam, encasing the locomotive in a shell of stainless steel the lines of which correspond to the sheathing of the cars and carry out their continuity of line. The Pacific type engines, 117 and 118, are of the class described on page 86.

Attaining such new heights in modern transportation science and artistic skill *The Crusader* brings to patrons of The Reading a train as luxuriously comfortable as an exclusive club, without in any way impairing its utility; a train, which, even when motionless, manifests the hidden power that insures a swift, sure flight over a smooth, carefully maintained right-of-way.



THE

Crusader

Clad in its shining armor of stainless steel—emblazoned in heraldic blue—streamlined from engine headlight to observation end, *The Crusader* represents the ultimate in ultra-modern railroad travel comfort—makes manifest, too, the ever onward march of Reading Company progress.

A BRIEF HISTORY OF THE READING SYSTEM

J. V. Hare, *Secretary and Treasurer*

Claim may be made that the history of the Reading System goes back to 1791, for on December 3rd of that year a special charter was granted by the General Assembly of Pennsylvania to "The President, Managers and Company of the Schuylkill and Susquehanna Navigation" for the purpose of opening a canal between the Schuylkill and Susquehanna Rivers in Pennsylvania. This Company and another canal company, formed May 30, 1792, were merged in 1811 to form The Union Canal Company of Pennsylvania, which in 1830 built a small stretch of railroad purchased by the Reading in 1866.

Among the other early railroads which later became a part of the Reading System were Mine Hill and Schuylkill Haven Railroad, Schuylkill Valley Navigation and Railroad and Mill Creek and Mine Hill Navigation and Railroad, which were incorporated in 1829; and the Philadelphia, Germantown and Norristown Railroad, which was incorporated in 1831.

The Philadelphia and Reading Railroad Company, the real forerunner of the present System, was incorporated by special act of the Legislature of Pennsylvania approved April 4, 1833. The charter granted to the Company December 5, 1833, authorized it to construct a railroad from Reading to Philadelphia. By a later statute, the Company was authorized to extend its road from Reading to Port Clinton, where connection was made with the Little Schuylkill Navigation and Railroad (incorporated in 1827).

The Reading Railroad was planned primarily to transport anthracite coal from the Schuylkill Region to Philadelphia and intermediate points in the Schuylkill Valley, in which a number of blast furnaces were operating.

Eminent engineers were employed to locate and construct the Philadelphia & Reading Railroad. In laying out the railroad, the foremost object was to secure a route in which there would be no adverse grade against the southbound loaded movement and no descending grade in excess of 19 feet per mile. This basic plan, which was adhered to and carried out in spite of all obstacles and expenses, secured for all time the advantages of grades that enabled an engine to take back to the mines as many empty cars as it hauled under load to tidewater.

On December 5, 1839, the Railroad was opened to traffic from Reading to Philadelphia and on January 1, 1842, the first locomotive and train passed over the entire line between Mount Carbon, in Schuylkill County, and Philadelphia. On May 17, 1842, the Richmond Branch from the Falls of Schuylkill to the Terminal at Port Richmond, on the Delaware River, was opened for the accommodation of the coal trade in which, from that time, the Reading has been an important factor.

In 1853, The Philadelphia & Reading Railroad Company began the construction of the Lebanon Valley Railroad, extending from Reading to Harrisburg. The line was completed in 1858 and was merged into the Reading Railroad. It has since been known as the Lebanon Valley Branch.

In 1857 control was secured of the Northern Liberties and Penn Township Railroad, located in Philadelphia, and it was consolidated with the Reading Railroad on May 8, 1871. This road had been constructed in 1835 and, after its acquisition, gave the Reading a line to the Delaware River extending along Willow Street from Broad Street. The terminus of this line has developed into the extensive terminal now known as the Willow and Noble Streets Freight Station. This is also the gateway through which, by means of the Belt Line, access is secured to the piers, warehouses and industries along the Delaware River front from Willow Street to Greenwich Point.

In the period between 1859 and 1870 The Philadelphia & Reading Railroad Company commenced the systematic expansion which has resulted in the development of the present Reading System. In that period, the Company acquired, through purchase or lease, branches extending generally to Lancaster, Shamokin, Allentown and Pine Grove, Pa., with an aggregate length of 481 miles.

Between 1870 and 1880, the System was further extended to Williamsport, Rockville, Bethlehem and Chester, Pa., and Bound Brook, N. J., by the acquisition of additional branches with an aggregate length of 303 miles.

Expansion between 1880 and 1890 extended the road to West Milton, Slatington, Catasauqua, Middletown and Shippensburg, Pa., and Port Reading, New Jersey, when branches 186 miles long were acquired through lease or otherwise.

Gettysburg, Newtown and New Hope, Pa., were reached between 1890 and 1900, when 115 additional miles of line came under the control of the Reading.

Through the acquisition of the Philadelphia & Chester Branch and the Chester & Delaware River Railroad, the Philadelphia & Reading Railroad Company secured vast terminals extending along the Delaware River waterfront from Philadelphia through Chester to Marcus Hook, Pa.

Connection with the New York Central and Erie Railroads at Williamsport (Newberry Junction) was originally secured by the lease of the Catawissa Railroad. This opened up the route which has proved of great and increasing importance for the movement of traffic between the Eastern Seaboard and the West. The capacity of this route was greatly increased by the construction of the Shamokin, Sunbury & Lewisburg Railroad, which provides a short, direct route from the upper anthracite region on westbound traffic.

The Philadelphia, Harrisburg & Pittsburgh Railroad secured a connection at Shippensburg with the Western Maryland Railway and Cumberland Valley Railroad, now Pennsylvania Railroad, and opened a new route for the handling of traffic between the Atlantic Seaboard and the West, Southwest and Southeast.

The construction of the Port Reading Railroad and its extensive terminal at Port Reading, N. J., on the Arthur Kill, provided an outlet in the New York Harbor section for the distribution of bituminous and anthracite coal.

Reading Company was incorporated on May 24, 1871, as Excelsior Enterprise Company. In 1873 the name of the Company was changed to National Company and by Decree of the Court of Common Pleas, Philadelphia, Pa., entered December 7, 1896, the name was again changed to Reading Company.

Merger of Reading Company and Subsidiaries

On October 1, 1923, Reading Company entered into an agreement with:

Philadelphia & Reading Railway Company,
The Chester & Delaware River Railroad Company,
Middletown & Hummelstown Railroad Company,
The Rupert & Bloomsburg Railroad Company,
The Tamaqua, Hazleton & Northern Railroad Company,
The Norristown Junction Railroad Company,
The Philadelphia & Frankford Railroad Company,
The Philadelphia, Harrisburg & Pittsburgh Railroad Company,
The Schuylkill & Lehigh Railroad Company,
Shamokin, Sunbury & Lewisburg Railroad Company,
New York Short Line Railroad,
Norristown & Main Line Connecting Railroad Company,
and
Reading Belt Railroad,

for the merger of the several companies into Reading Company. Through this merger Reading Company became the operating Company and assumed operations January 1, 1924.

The Central Railroad Company of New Jersey

The Reading and the Jersey Central have been closely allied for sixty years or more for the records indicate that a through

traffic arrangement was made between those companies for the handling of oil and other products as early as 1870.

Upon the construction of The Delaware & Bound Brook Railroad and the Delaware River Branch of The North Pennsylvania Railroad, in 1874, both leased lines of Reading Company, a through route was established with the Central Railroad of New Jersey between Philadelphia and New York. The trains of each company used the tracks of the other. This New York service still continues.

On June 1, 1883, the relation between the Companies had become so interdependent that a lease was made of the Central Railroad of New Jersey to The Philadelphia & Reading Railroad Company. For financial reasons, this agreement was in effect only until January 1, 1887.

In 1901, Reading Company purchased a majority interest in the capital stock of the Central Railroad Company of New Jersey in order to further continue the traditional policy of close association of the Reading with the Jersey Central, which was successful from the start of its operations in developing a heavy and valuable traffic in bituminous coal and general merchandise through the Williamsport and Shippensburg gateways. The continuance of this traffic and the profitable handling of the Reading's local traffic to New York and adjacent points depended upon friendly cooperation and close relationship with the Jersey Central in the use of its important terminals. The Reading and the Jersey Central have continued their joint policy of keeping their terminals open to all connections on fair terms.

Electrification

Construction work was started early in 1929 on electrification of suburban lines from Philadelphia to Doylestown, Hatboro, West Trenton and Chestnut Hill. Electric train service from Philadelphia to West Trenton, Hatboro and Doylestown was inaugurated on July 26, 1931. In 1931, electrification of the line to Norristown was begun, and on February 5, 1933, electric train service to that point and to Chestnut Hill was commenced. Total electrified first track mileage is 84.07.

Mileage

On December 31, 1939, Reading Company owned, leased, operated and jointly controlled 2,616.90 miles of first track railroad. Mileage of all tracks is 6416.23. The Reading offers shippers on its line Nationwide freight service through interchange of traffic with its various rail connections at 76 junction points. Its Port Richmond Terminal in Philadelphia is considered the largest single tide-water terminal in the country.

The Reading maintains through passenger service between Philadelphia and Wilkes-Barre, Scranton, Binghamton, Syracuse, Ithaca, Buffalo, Rochester, Niagara Falls and Toronto, with the Central Railroad of New Jersey, Lehigh Valley Railroad and the Canadian National Railways.

Between Philadelphia and New York, the Reading in conjunction with the Central Railroad of New Jersey sets new standards of service. *The Crusader*, one of the most beautiful trains in the world, is leader of a fleet of fast, frequent trains between these metropolitan centers. Terminals in New York are at Liberty Street and West 23rd Street.

Equipment

On December 31, 1939, Reading Company owned the following equipment:

Class	*No. of Units*
Locomotives	728
Passenger Train Cars:	
Passenger	682
Baggage, etc.	131
Freight Train Cars	33,428
Floating Equipment	73
Work Equipment	498

#3916